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ABSTRACT

Middle school energy skills (Enerskills) and activities (Eneractivities) are provided in seven sections. Areas addressed include: (1) locating energy information using telephone books, dictionaries, card catalogs, and readers' guides; (2) writing letters for energy information; (3) energy and food (food intake/human performance, calories/energy); (4) energy and the environment (human ecology, population growth, food supply, energy sources, air pollution, recycled resources, living spaces, propaganda techniques in energy education); (5) energy in daily living, focusing on heat production, electricity usage, electric light bulbs, home/school energy audits; (6) energy in science (large number concepts, absorption of solar radiation, insulation, conversion of wind to electrical energy, recycling waste to produce/conserve energy, fuel from fruit, finding a calorie of energy); and (7) exploration studies in vocational education, focusing on guidelines for passive construction design and working with EnergyGuide Labels (a new approach for conserving energy using labels on new appliances). Sample EnergyGuides are included. (JN)

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HIGHLANDS COUNTY ENERGY EDUCATION ACTIVITIES

--MIDDLE SCHOOL LEVEL--

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Supported by the Highlands County Schools, Billy C. Cason, Superintendent, and David Robinson, Jr., Director of Instruction; and by a mini-grant from the Office of Energy/Environmental Education, Department of Education, C. Richard Tillis, Director, and R. Frank Kapp, Regional Coordinator.

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I ENERSKILLS:

LOCATING ENERGY INFORMATION

ENERSKILLS NAME_____

LOCATING INFORMATION: USING THE TELEPHONE BOOK

1. Using the telephone book, how would you find the telephone number of the Florida Solar Energy Center, Cape Canaveral, FL?

   The number for the Florida Solar Energy Center is ( )_____

2. Using the telephone book, how would you find the telephone number of your County Home Economics Extension Agent?

   The number is ( )_____

3. Using your telephone directory, how would you find the number of the Governor's Energy Office, Tallahassee?

   The number is ( )_____

4. Using your telephone directory, how would you find the number of the United States Department of Energy?

   The number is ( )_____

5. You have purchased more insulation and a solar collector. You want to check on your income tax credit with the IRS (Internal Revenue Service, U. S. Government). How would you call them, using the telephone directory to locate their number?

   The IRS number for your area is ( )_____

6. You want to have your electric meter checked to see if your bill at home is accurate. Use the telephone book and write down the number for your local electric utility company ( )_____.

7. You want to see if the local library has Dr. David E. LaHart's latest book on nuclear power. Use the telephone directory to get the name, address, and telephone number of your library ( )_____.

ENERSKILL NAME_____

USING THE YELLOW PAGES: LOCATING INFORMATION

Get a local telephone book and turn to the yellow pages. Use the yellow pages to respond to the following questions.

1. What are the yellow pages used for?

2. What information is presented in the yellow pages?

3. Why would the telephone company have a separate section called the "yellow pages"?

4. If you wanted to get a plumber to install a solar water heater, where would you look in the yellow pages? Give the names of two plumbers you might call to get such an installation.

5. If you wanted to purchase a solar water heater, where would you look for solar companies in your area? Give the name and phone number of one company which might be able to sell you a collector for your roof.

6. If you wanted to check the EER (Energy Efficiency Rating) of three refrigerators advertised in the newspaper, who would you call? Give the names, addresses, and telephone numbers of three companies in your area who sell refrigerators.

7. If you wanted to call an appliance store owner to check on the prices of fans and dehumidifiers, who might you call? Write down the name, address, and telephone number of the store closest to your school.

8. You want a ceiling fan for your den or living room. Use the yellow pages to locate the store specializing in ceiling fans which is closest to your home. Write down the name, address, and telephone number for that store.

ENERSKILLS NAME_____

LOCATING INFORMATION: USING THE DICTIONARY

The dictionary is used to find the meanings of words, to find out how to spell and pronounce words, and to find out about the history of words. Answer the following questions, using your dictionary.

1. Use each of the following words in a sentence:

   a) POWER_____
   b) ENERGY_____
   c) WORK_____
   d) ELECTRICITY_____
   e) WATT_____

2. Look up the meanings given for each word. Write out the meaning for each word which reflects how you have used the word in your sentence.

   a) POWER_____
   b) ENERGY_____
   c) WORK_____
   d) ELECTRICITY_____
   e) WATT_____

3. Divide each word into syllables:

   a) POWER_____
   b) ENERGY_____
   c) WORK_____
   d) ELECTROCOTY_____
   e) WATT_____

4. Write a sentence or two on the history of each word.

   a) POWER_____
   _____
   b) ENERGY_____
   _____
   c) WORK_____
   _____
   d) ELECTRICITY_____
   _____
   e) WATT_____
   _____

Write down the name of the dictionary you used:_____

ENERSKILLS NAME_____

LOCATING INFORMATION: USING THE CARD CATALOGUE

Go to the card catalogue in your local library and find information on NUCLEAR ENERGY.

1. How many SUBJECT HEADINGS are there for this topic?

2. List three of them. _____

   _____

   _____

3. Look up the following topics and give the SUBJECT HEADINGS under which you could find books on them:

   a) NATURAL GAS_____

   _____

   b) CONSERVATION, ENERGY_____

   _____

   c) SHALE OIL_____

   _____

   d) WINDMILLS_____

   _____

   e) PIPELINES, PETROLEUM_____

   _____

NAME_____

LOCATING INFORMATION: USING THE CARD CATALOGUE

Go to the card catalogue in your library and look up a book on SOLAR ENERGY. Then, answer the following questions.

1. Under what subject heading did you look?

2. How many books were there on this topic: 1-5____ 6-10____ 10-50____ 50+____

3. Were there any SEE ALSO CARDS included in this topic?

   If the answer is YES, under what other subject headings could you find information on SOLAR ENERGY?

4. Pick out one of the books you have found on this topic and fill in the following information:

   Title of the book_____ Call Number_____

   Author_____

   Date Published_____

   Number of pages_____ pages

NAME_____

LOCATING INFORMATION: READERS' GUIDE

Please study the sample Readers' Guide entry below. Then, answer the following questions about the second sample entry.

Sample:

CIVIL rights demonstrations
Day they didn't march. L. Bennett, Jr. il Ebony 32:128-30+ F'77

Explanation

An illustrated article on the subject "CIVIL rights demonstrations entitled "Day they didn't march," by L. Bennett, Jr. will be found in volume 32 of Ebony magazine on pages 128-30 (continued on later pages of the same issue), February 1977.

Second Sample:

NUCLEAR energy
No nuclear energy for us please: European letter to President Reagan. B. Tillis. Bull Atom Sci 38:7 D '81

What does this entry tell you?_____

_____

_____

_____

_____

Activity: Go to the Readers' Guide and look up an entry on Solar Energy. Write down the entry and then tell what it means.

Entry_____

_____

_____

Meaning_____

_____

_____

NAME_____

LOCATING INFORMATION: READERS' GUIDE

In the blank space before each of the following statements, write the word true if the statement is true. Write the word false, if the statement is not true.

_____ 1. The READERS' GUIDE is an up-to-date listing.

_____ 2. The READERS'GUIDE lists the subjects of magazine articles.

_____ 3. The READERS' GUIDE tells you the name of the magazine in which the article appeared.

_____ 4. The subjects in the READERS' GUIDE are in alphabetical order.

_____ 5. Not all magazines published have their articles listed in the READERS' GUIDE.

_____ 6. The READERS' GUIDE tells you the author of the article.

_____ 7. The READERS' GUIDE tells you the page numbers of the article.

_____ 8. The READERS' GUIDE tells you the title of the article.

_____ 9. The READERS' GUIDE tells you if the article has illustrations.

_____10. The READERS' GUIDE tells you if the article is hard or easy to read.

 Name_____

LOCATING INFORMATION: USING AN ATLAS

Go to your library and find the atlas. Then, use the atlas to answer the following questions.

What is the name of your atlas?
Who published it?
When was it published?

1. Finding a place in the atlas is very similar to using the Index in a book. Some atlases will use letters as guide numbers while others use letters and numbers, or only numbers as guides to finding a location. Turn to the Index to find the following places which are important in world energy trade:

	Page	Guide Numbers
Cape of Good Hope		
Persian Gulf		
Saudi Arabia		
Kwait		
Nigeria		
Angola		
Suez Canal		
Venezuela		
Mexico		
Louisiana		

2. What other information does the atlas which you are using give you about world energy resources and commerce in energy?

3. Use a recent newspaper to locate an article on energy resources. Find the places mentioned and note the pages and guide numbers of these places in your atlas.

ENERSKILLS NAME _____

LOCATING INFORMATION: MAKING A GENERAL SEARCH

Go to your library and find a ( ) map ( ) book ( ) article ( ) encyclopedia entry on ENERGY CONSERVATION AT HOME.

1. Briefly tell HOW you completed this assignment.

2. I had trouble with this search and had to ask the librarian for help. The librarian suggested that I...

3. I have the following questions about finding books, maps, articles, etc. in the library.....

II ENERSKILLS:

WRITING LETTERS
FOR ENERGY
INFORMATION

ENERSKILLS

Writing Letters: Environmental Terms and Project

Objectives: Students will practice using reference books and resource books and learn to write a business letter

Materials: Paper, envelope, stamp, library with reference books.

Procedures: Use the dictionary and resource books to define these terms related to ecology. Be prepared to discuss them in detail.

1. ecology
2. oranism
3. environment
4. extinct
5. adaptation
6. habitat
7. interrelationship
8. biome
9. predator
10. overpopulation

Procedure 2: Write a letter to a local environmental group asking for information about environmental projects in your city. See if there is any way you can participate in the projects. Report your findings in class and plan a class project.

1 GENERAL ENERGY INFORMATION

United States Department of Energy (DOE)
Office of Public Affairs
Washington, D.C. 20585
202/633-8858

Publications about all energy sources and information on how to conserve energy may be obtained by writing or calling the D.O.E.

The Department operates a toll-free consumer hot line (800/424-9246) for current gasoline and heating oil price matters. A toll-free temperature control hot line (800/424-9122) explains mandatory thermostat settings and responds to noncompliance report data.

Edison Electric Institute (EEI)
1111—19th Street, Northwest
Washington, D.C. 20036
202/828-7400

EEI, an association of 150 investor-owned electric companies, provides information on virtually every topic concerning electrical energy. A variety of materials, including pamphlets and films, are available. Inquiries should be addressed to EEI's Department of Public Relations.

American Ventilation Association (AVA)
P.O. Box 7264
Houston, Texas 77008
713/869-6281

AVA, an association of residential air ventilation product manufacturers, offers information on the importance of ventilation in home heating and cooling (as well as how proper ventilation can be achieved).

Electric Power Research Institute (EPRI)
P.O. Box 10402
Palo Alto, CA 94303
415/855-2000

EPRI is funded by more than 500 electric utilities. The Institute issues publications about current research and development...including solar, coal, geothermal, fusion, environmental, nuclear and fossil fuel generation projects.

Association of Home Appliance Manufacturers (AHAM)
Attn: Public Affairs
20 North Wacker Drive
Chicago, Illinois 60606
312/984-5800

AHAM offers publications on efficient use and care (resulting in energy savings) of refrigerators, freezers, air conditioners and other electrical appliances. AHAM also offers purchasing tips on what to look for in appliances that meet your specific needs.

American Society of Heating, Refrigerating & Air Conditioning Engineers (ASHRAE)
345 East 47th Street
New York, New York 10017
212/655-7953

ASHRAE is the professional association of heating, cooling and refrigeration engineers. ASHRAE makes available material about nonresidential heating and cooling in such topic areas as conservation, insulation and solar energy. A list of ASHRAE publications may be obtained by contacting the Society's Circulation Sales Department.

National Rural Electric Cooperative Association (NRECA)
1800 Massachusetts Avenue, N.W.
Washington, D.C. 20036
202/857-9500

NRECA is the national association for 1,000 rural electrical cooperatives and public power districts. NRECA can provide information regarding rural power programs and policy issues, and can answer questions about energy production and supply as it pertains to agricultural, economic and community development of rural America.

Food and Energy Council
909 University Avenue
Columbia, MO 65201
314/442-5517

The Council is comprised of electric power suppliers, equipment manufacturers and agricultural interests. It distributes materials about the direct relationship between adequate supplies of food and energy.

National Electrical Manufacturers Association (NEMA)
2101 "L" Street, Northwest
Washington, D.C. 20585
202/457-8400

NEMA represents over 550 manufacturers of equipment used in machines, lighting equipment and other products utilizing electricity. NEMA produces an audit handbook for conserving energy in commercial and retail establishments (cost $1). Through its in-house National Lighting Bureau, NEMA provides information on efficient sources of lighting.

Source: Florida Power & Light Company, 1980.

2 INFORMATION ABOUT SPECIFIC ENERGY SOURCES

National Coal Association (NCA)
1130 — 17th Street, N.W.
Washington, D.C. 20036
202/628-4322

NCA is an association of coal producers, sellers, equipment suppliers and transporters. NCA offers publications on coal production, distribution, usage and research.

American Petroleum Institute
2101 "L" Street, Northwest
Washington, D.C. 20037
202/457-7090

API represents over 7,000 petroleum producers, refiners, marketers and transporters. API provides publications and information on any petroleum topic, including exploration, production, refining, marketing, transportation, research, and product protection and safety.

American Nuclear Society (ANS)
555 North Kensington Avenue
LaGrange Park, IL 60525

The ANS has a membership base of 12,000 physicists, chemists, educators, engineers, mathematicians, metallurgists and life scientists. The ANS offers publications answering questions concerning nuclear energy.

American Nuclear Energy Council
1750 "K" Street, Northwest
Suite 300
Washington, D.C. 20006

The Council represents 120 organizations interested in nuclear energy as one method to assure an adequate supply of energy. The Council can provide information regarding nuclear issues and legislation.

Wood Energy Institute (WEI)
Box 800
Camden, ME 04843

WEI is sponsored by business groups, testing labs, universities and government agencies. It provides information on wood fuel usage and efficiency, and can direct consumers to suppliers of wood fuel burning equipment. Inquiries should be accompanied by a stamped, return-mail envelope.

American Gas Association (AGA)
1515 Wilson Boulevard
Arlington, VA 22209
703/841-8400

AGA is an organization of 6,000 individuals and companies involved in gas production, distribution, transportation or other gas-related endeavors. AGA's Consumer Information Service provides information on the production, distribution, consumption, research and safety of natural, manufactured and mixed gases.

American Wind Energy Association
1621 Connecticut Avenue, Northwest
Washington, D.C. 20009
202/667-9137

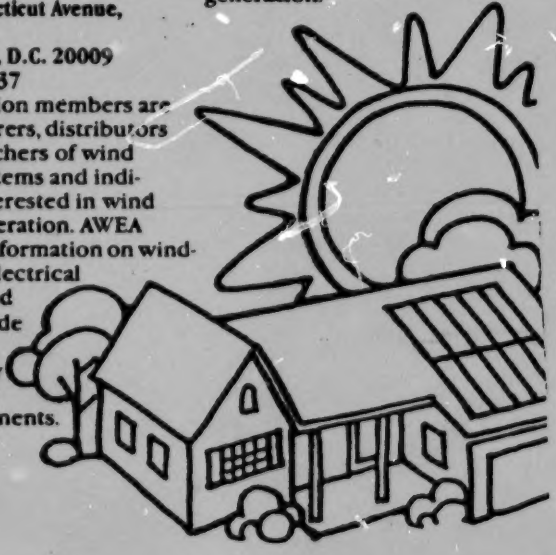
Association members are manufacturers, distributors and researchers of wind energy systems and individuals interested in wind power generation. AWEA provides information on wind-powered electrical systems and offers a guide to wind and energy equipment components.

National Solar Heating and Cooling Information Center
P.O. Box 1607
Rockville, MD 20850

The Center is operated by Franklin Institute Research Laboratories for the U.S. departments of Housing and Urban Development and Energy. The Center provides solar heating and cooling information (including names of builders with solar experience and architects who specialize in solar design). A toll-free hot line (800/523-2929) is provided for questions.

Atomic Industrial Forum (AIF)
7101 Wisconsin Avenue
Washington, D.C. 20014
301/654-9260

AIF is comprised of industrial firms, research organizations, educational institutions, labor groups and government agencies engaged in development and utilization of nuclear energy for constructive purposes. The AIF can provide materials on all aspects of nuclear power generation.



3 FLORIDA ENERGY INFORMATION RESOURCES

Governor's Energy Office
The Capitol
Tallahassee, Florida 32304
904/488-6143

The Governor's Energy Office serves as a clearinghouse for information regarding Florida energy sources. In addition to planning state energy policy and programs, the GEO provides publications and films that may not be available from individual county Energy Information Centers.

Florida Petroleum Council (FPC)
111 North Gadsden
Tallahassee, Florida 32301
904/222-0220

The Council is a Division of the American Petroleum Institute. The FPC—which represents petroleum suppliers, transporters and others involved in petroleum production and distribution in Florida—can provide information about petroleum issues.

Florida Natural Gas Association
815 Brierdiff Drive
Orlando, Florida 32806
305/898-4558

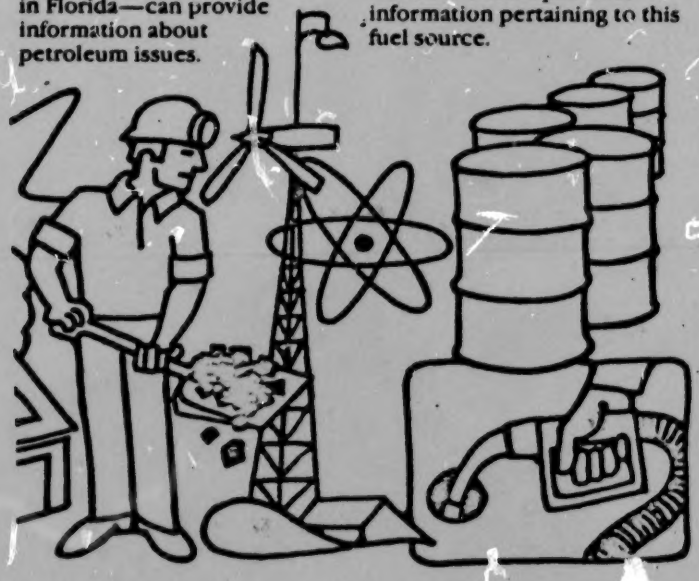
The trade association of natural gas companies serves as a clearinghouse for consumer gas problems and provides information on gas utilization.

Florida Public Service Commission (FPSC)
101 East Gaines Street
Tallahassee, Florida 32301

The Florida Public Service Commission is the regulatory agency of nonmunicipal electric, gas and telephone utilities operating in Florida. The FPSC offers a toll-free hot line (800/342-3553) to answer inquiries regarding rates and service.

Florida LP Gas Association
P.O. Box 897
Maitland, Florida 32751
305/628-3093

Members of the Florida LP Gas Association are suppliers and licensed dealers of LP-gas. The Association provides information pertaining to this fuel source.



County Energy Information Centers (Cooperative Extension Offices)

The Governor's Energy Office has designated the Cooperative Extension Office in each Florida county as the local County Energy Information Center. In addition to offering energy-related brochures, the Cooperative Extension Offices serve as a community resource to answer energy-related questions, particularly in the areas of agriculture and home economics. To contact the County Energy Information Center, call the county government section, Cooperative Extension Office as listed in the telephone directory.

Alerting Women About Resources & Energy (AWARE)
402 Reo Street, Suite 214
Tampa, Florida 33609

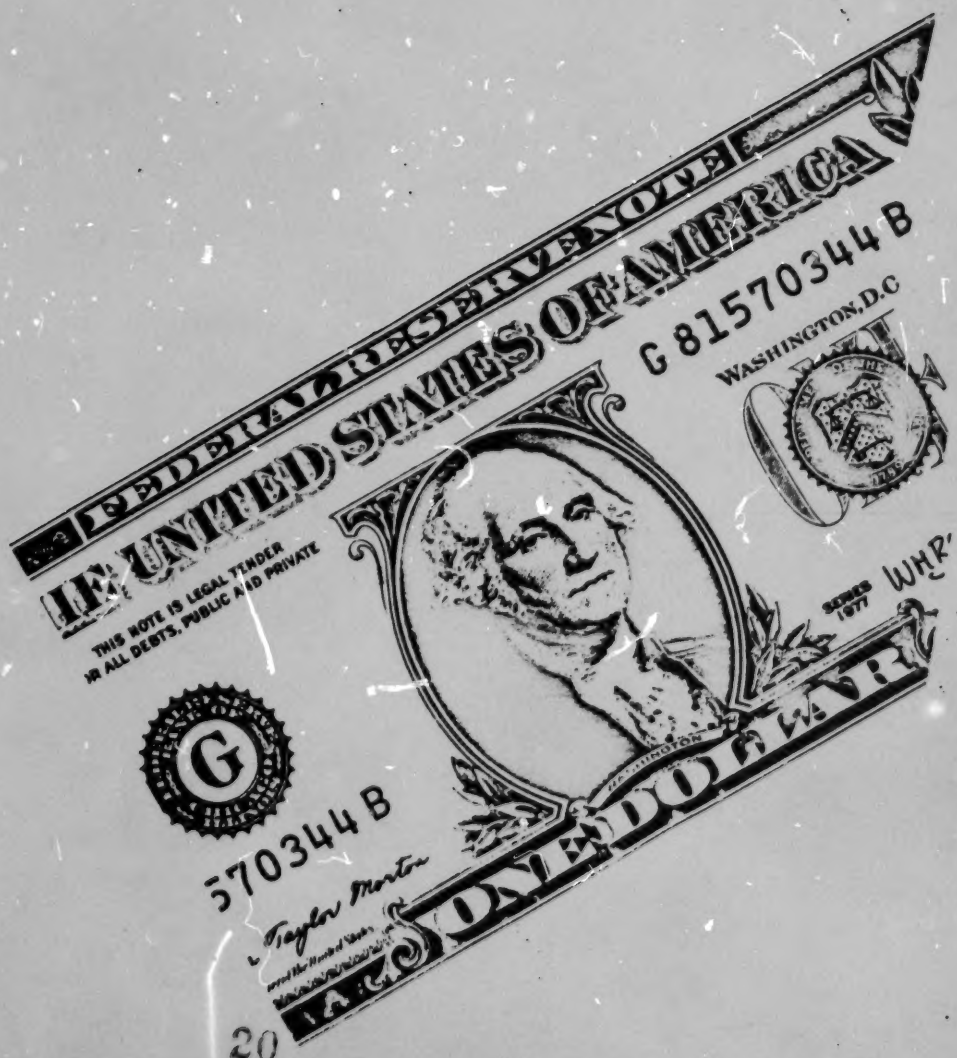
AWARE is a public-interest organization of women employed in Florida's utility industry. AWARE promotes energy resource awareness and conservation among women in the state. AWARE sponsors energy seminars and workshops and works with other women's groups in energy education.

Florida Solar Energy Center
300 State Road 401
Cape Canaveral, FL 32920
305/783-0300

Operated by the State University System, the Center provides information on solar energy and its application in Florida. The Center also provides services to professional groups such as architects, builders, engineers and teachers. The Center maintains a library open to the public. Write for information, or call toll-free 800/432-0575.

III ENERACTIVITIES

ENERGY AND FOOD



ENERACTIVITY

FOOD ENERGY RELATED TO PERFORMANCE

Objectives:

1. become aware of breakfast eating habits
2. look for a performance relationship between those who eat good, poor, and no breakfast.

The students will keep a record of his breakfast eating habits, time his performance on a running event, and keep a chart of it.

Materials:

1. track or a specific area to run
2. stop watch
3. recording materials - 3 different colors

Procedure: The 3 different colors will help give the chart it's meaning. (ie - green - ate a good breakfast, yellow-not very nutritious, red-no food.) The students will be comparing their breakfast eating to their own timed run.

Time needed: 15 minutes per class for 10 days.

After the experiment is completed, discuss their findings and see if there is a relationship between breakfast and running.

Follow up lesson possibilities:

1. What the body does with the food it intakes
   How is it changed into energy
2. How the body is like an engine.

ENERACTIVITY

EATING THE SUN'S ENERGY

Objective: Relate how all foods are grown by the sun.

Materials: pictures of food and animals

Procedure: The teacher holds up a picture of a hamburger on a bun. Where did the bun come from? Explain how the sun's energy was used to grow the wheat and grain used in the bun. Break down all the parts of the hamburger and relate them back to the sun.

Now hold up some new pictures of food and animals and have the students trace them back to the sun's energy.

Time Needed: 1-30 minute class

ENERACTIVITY

CALORIES AND ENERGY

Objective: Show which foods you will get the most energy from.

Background:

Carbohydrates	-	4 calories per gram
Fats	-	9 calories per gram
Protein	-	4 calories per gram

Define calorie - amount of energy needed to raise the temperature of water one degree celcius.

1. Develop what foods are found in the carbohydrate group, fats group, protein group.
2. Explain to students that calorie amount information can be found on the outside label of most cans, boxes, and packages. Then they can calculate the amount in one helping of so many grams.
3. Develop foods needed or available for quick energy.
4. Go into what happens to food not spent on energy - stored as fat.

NOTE: The next three pages deal with energy in Food Problems. The first compares "Domestic" and Wild Foods. The next two offer problems on energy Investments" in our food/diets. The second one deals with the Law of Diminishing Returns.

ENERGY ERROR: Russell was a nature buff and took long, joyful walks in the woods collecting natural foods. He always came home loaded down with fresh dandelion greens, wild asparagus, and other plants. Russ prepared them and ate them as part of his meals. His neighbor, Sally, thought that Russ was a bit daff. She told him that there was little food value in those wild things. To be healthy he should eat vegetables grown in rich, well-fertilized farmland. Russ laughed, but is he making an energy error?

CALORIC CONTENT OF WILD AND GARDEN VEGETABLES

WILD VEGETABLE	food energy calories/100 grams
Green Amaranth*	36
Wild Asparagus*	26
Chicory Greens*	20
Dandelion Greens*	45
Lamb's Quarters*	43
Poke Shoots*	23
Purslane	21
Watercress*	19
Curled Dock	28
GARDEN VEGETABLE	
Cabbage	24
Celery	15
Endive	20
Iceberg Lettuce	13
Leaf Lettuce	18
Green Onions	36
Green Peppers	22
Spinach	26
Swiss Chard	25

* Description and directions for use of these wild foods given in Stalking the Wild Asparagus, McKay, 1961.

SOURCE: National Science Teachers Association.

ENERGY ERROR: Dot and Howard are discussing the export of grain from the United States. Dot is upset about the ever rising price of beef, especially grain-fed beef. She argues that energy is more expensive than ever and that it takes more and more energy to grow the corn that beef cattle eat. Thus, the beef is ever more expensive. Is Dot making an energy error?

GROWTH IN ENERGY USE IN CORN PRODUCTION

Fossil Fuel Energy Inputs (Calories/Acre)

Inputs	1945			1970
Fuel	543,400			797,000
Nitrogen Fertilizer	58,800			940,800
Pesticides	0			22,000
Crop Drying	10,000			120,000
TOTAL	925,500			2,896,800

CORN PRODUCTION (per Acre)

Year	Amount of Corn Produced (bushels)	Energy Content of Corn (Calories)
1945	32	3,427,200
1970	81	8,164,800

SOURCE: National Science Teachers Association.

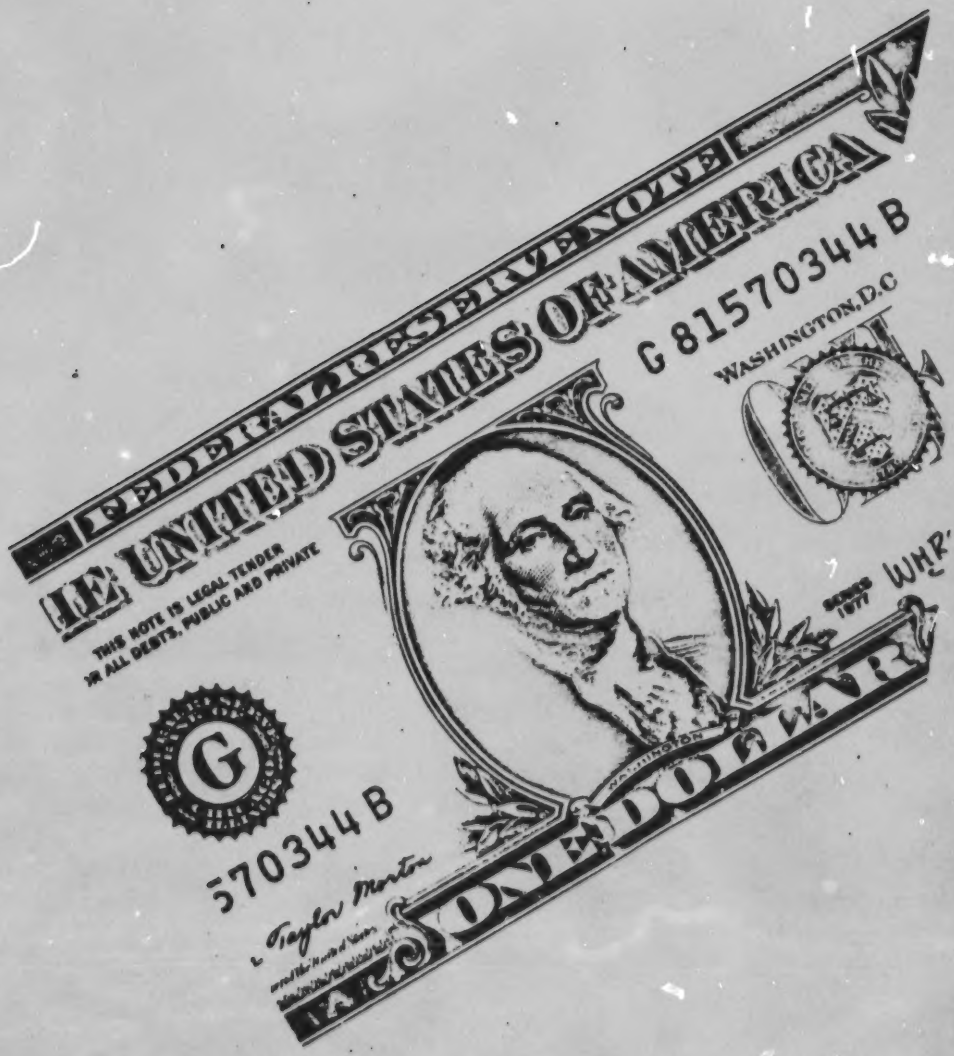
ENERGY ERROR: After years of spreading cow manure on his fields, Jesse Coley had learned about chemical fertilizers for his corn. Several years ago, he bought some and increased the size of his corn crop. The next year he used more, and got more corn. Since then he has increased his use of high-energy nitrogen fertilizers on his corn. Unfortunately, while the corn crops get larger, the amount of increase is getting smaller. The cost of the fertilizer is going up sharply, and Farmer Coley is making less money. Has Jesse Coley made an energy error?

CORN - YIELD GAINS FROM SUCCESSIVE FERTILIZER APPLICATIONS

Pounds of Nitrogen Fertilizer Applied per Acre	Corn Yield Lbs/Acre	Change in Corn Yield per Pound of Extra Nitrogren Fertilizer Applied
0	2800	-
40	3880	27
80	4400	14
120	4800	9
160	4960	4
200	5000	1

Source: U.S.D.A. - Corn Yield In Iowa, 1964.
SOURCE: NATIONAL SCIENCE TEACHERS ASSOCIATION.

IV ENERACTIVITY AND ENERSKILLS:
ENERGY AND OUR ENVIRONMENT



NERACTIVITY

ALTERNATIVES FROM HISTORY

bjectives: Provide experience in finding alternatives for everyday activities by making historical comparisons. Helps students become aware of necessary/unnecessary energy uses.

rocedures: Students make a list of things used and things they do daily which involve the use of energy.

Students use this list and write alternatives from history which would be acceptable and would also be more energy efficient.

To encourage kids to come up with alternative answers for their energy needs based on historical similarities.

ENERACTIVITY

HUMAN ECOLOGY

Objective: Gain an understanding of the relationship between people and their environment.

Problems:

1. What kind of problems may be created by high concentration of people in an area?
2. Are any of these problems related to the supply of food and energy? The quality of our air and water? The disposal of waste?
3. How are these problems being solved?

TEXT RESOURCES: Focus on Life Science, Pathways to Science, Biological Science.

ACTIVITY ONE

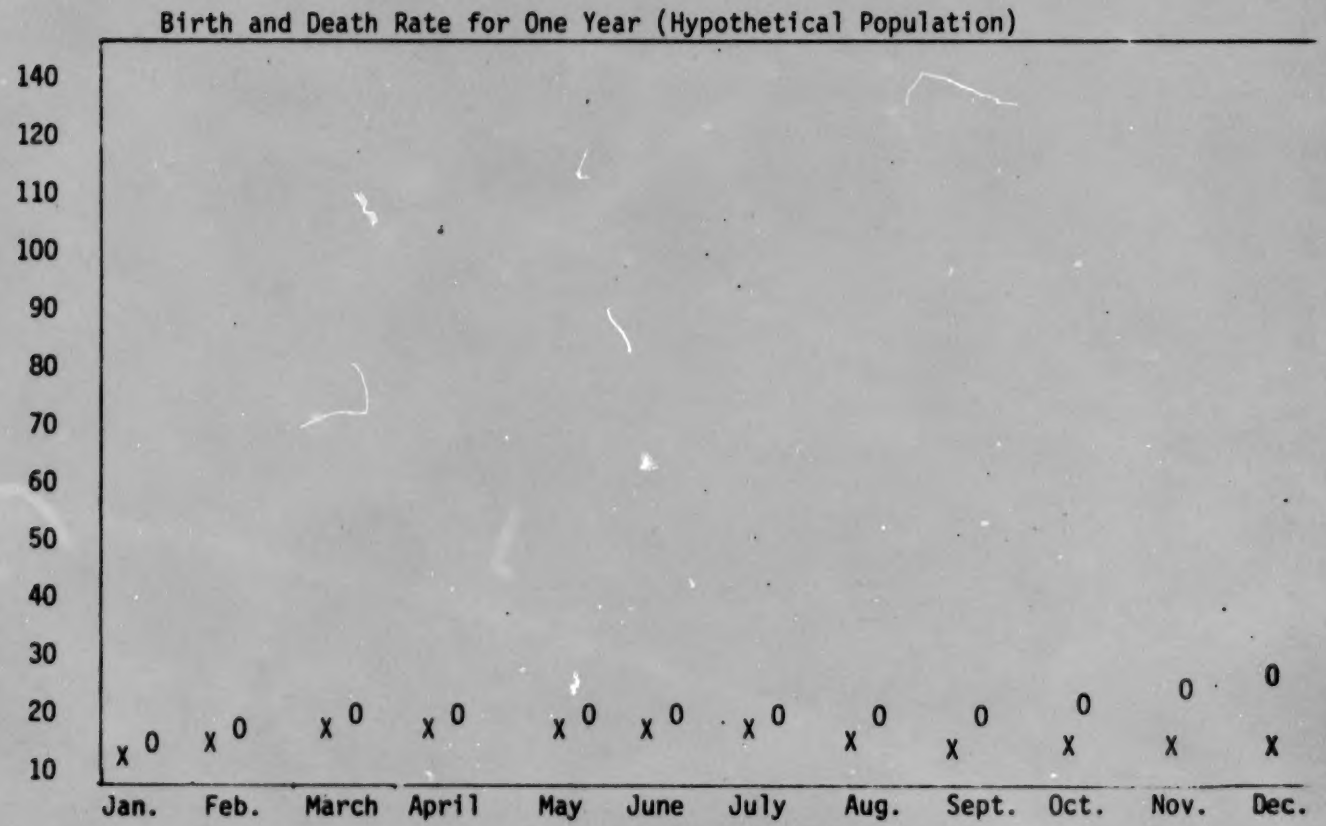
A. Population Growth

Human population is more rapid today than ever before. Before AD1 it took 2000 years for the world's population to double. In contrast by 1975 it had only taken the world 45 years to double.

What are some of the reasons for this increase in growth population? For one, there is a decrease in the death rate of children. They are living and growing to produce more children when they are old enough. Increased and better improved medications have helped increase the growth rate. Better living conditions have helped too.

How does the increase of population growth affect the world. Environmental problems, increase of natural resources, need of more food, home building supplies, more fibers for clothing. All these are bringing more and larger problems for man.

PROBLEM: Suppose the birthrate of a population decreased while the death rate remains the same. Would the size of the population decrease or increase? Draw and plot a hypothetical example using made-up numbers which can prove your answer.



B. Food Supply

More than one half the world's people are undernourished. Their daily diet does not contain all the required nutrients. At least 12,000 people in the world die each day from starvation. According to Thomas Malthus, population increases geometrically while food supply only increases arithmetically. Unless solutions are soon forthcoming, Malthus prediction of worldwide famine and disease epidemics may come true. To feed the world's population properly the rate of food growth must grow at a rate of three percent per year. For this increase the amount of land used for crop production must increase. Some desert lands through proper irrigation have been reclaimed.

The other efforts which are being tried are fertilizing better, chemical pesticides, new variety of plants, and fish farming.

PROBLEM: Form a class debate. Have students research and discuss the pros and cons of the pesticides question - What are the dangers in using chemical pesticides

Ideas

1. Waste run offs from groves sprayed with pesticides
2. Dead animals and trees spilling into streams
3. People dumping garbage into local water
4. Factory run off into streams
5. What happens to plants and animals in the streams?
6. What happens to the people who eat these plants and animals?

ACTIVITY THREE

C. Energy

Energy is defined as the ability to do work or to move a force through a distance. We need and use energy in our homes, industries, transportation, schools, offices, heating, cooling, and food production

PROBLEM: Using library resources, identify those countries having the major reserves of coal and oil. (Hint: try your local gas stations and power plants for resources.)

Coal and petroleum are two major sources of energy but they are non-renewable and we are doing this at a very quick rate. Pollution from the burning of coal and petroleum has been a major problem also.

Four experimental energy sources which are being experimented with today are wind power, geothermal, nuclear, and solar. Wind power has been used for years for irrigation mainly. Today they are trying to take the wind to generate power. This power will be converted to electrical power.

Geothermal energy uses the hot spots in the earth to change water to steam which under pressure rises up to generate electricity. Nuclear energy is obtaining energy through the splitting of an atomic nucleus of a radioactive element. This results in a large amount of clean energy and the problem of what to do with nuclear waste. Solar energy is using the sun's energy collected by solar panels. The panels will need a lot of area just to collect a small amount. This is another problem to solve.

PROBLEM: Lab Activity

Tie a piece of thread to a thumbtack. Push the tack onto a piece of cork that fits on a clear bottle. Put the cork on the bottle with the string hanging down inside. Use a hand magnifying glass to focus the sun's rays on the thread from outside the bottle. What happens? Would you get the same results without the magnifying glass?

PROBLEM: Take this questionaire home to see how much your home is doing to help conserve energy. Maybe you can find some things to improve on and save your parents money. (Questionaire attached behind test)

D. Air Pollution

This is a major problem in most large cities today. The air is polluted in many ways--industries, burning of trash, vehicles, and chemical pesticides. Polluted air can be unpleasant to breath and harmful to health. It can also harm food production.

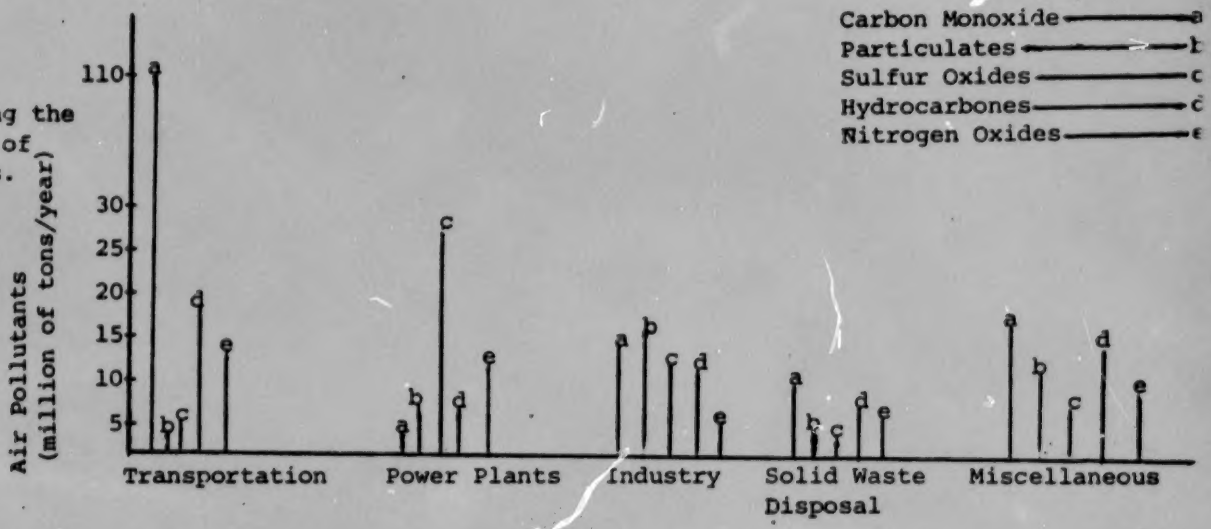


Figure: Graph comparing the major sources of air pollitants.

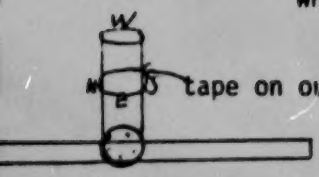
From the graph you can deduct the largest pollitants in the United States are carbon monoxide (95% from vehicles) and sulfer dioxide (85% from the combustion of oil, coal, and gas - coal is responsible for 60% of the total).

Photochemical smog is sunlight on waste material released from buring fuel. This causes irritation to the lining of the nose and throat. This occurs often over cities in southwestern United States.

What are some methods of helping to solve air pollution? Putting filters in smokestacks to stop solid particles, use cleaner sources of coal, require automobile engines to meet certain standards, and stricter laws on burning trash.

PROBLEM: Lab Activity

To deduct pollution particles in your area. Take a quart size jar with reversible tape put around the entire outside. Nail the top of the jar inside facing up to a piece of wood. Put the jar back onto the top which is now nailed to the wood. Place the wood/jar structure in a spot exposed to wind from all directions and label the directions. Leave tied there for one week. Decide which direction produces the most pollution.



ACTIVITY FIVE

E: Recycled Resources

Recycling means using something over again after it has been used. About one third of all paper products manufactured each year are made from waste paper. For example, paper sacks and newsprint. This reduces the natural resources demand of trees from being wasted.

The average solid waste in the United States if about 8 kg (17½ lbs.) per day. Most of this can be burned but you face the environmental problem. Some incinerator ships are being used in heavy populated areas which are already engulfed with air pollution.

Steel, plastics, lead, bottles, and cans are presently all being recycled to some degree. This is important in terms of savings in energy, mineral sources, and land. By recycling resources, people are imitating nature. For example, the natural recycling of carbon or nitrogen.

Nature always reclaims its materials which have been removed from the earth. Wood decays, iron rusts, concrete is eroded by weather. Natural physical and chemical changes act on all synthetic products in time.

ACTIVITY SIX

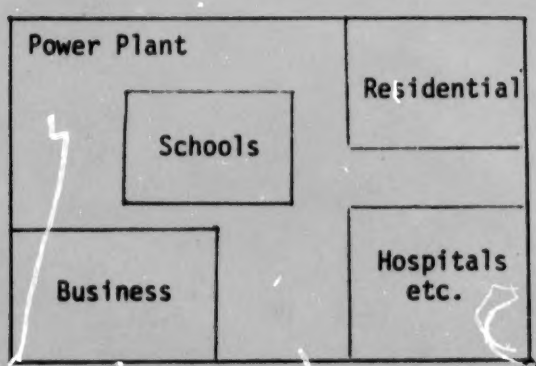
F. Living Spaces

Most Americans live in cities and surburbs today. Only ten percent live in rural areas. Consequently crowding people into small land areas may create ecological problems. Problems such as we have already studied plus mental health, depression, agtressiveness, and hostility. Limited outdoor recreation areas for outdoor activities have developed.

Some new towns built are clustering buildings into groups and leaving greenbelts-areas of grass and trees. People do not have to travel so far to work, school or where ever they are going so much so more time can be spent on leisure.

Old central cities are being remodeled and renovated to help meet the needs of people today.

PROBLEM: On a large poster board design a new town based on a population of 25,000. Remember shopping areas, working areas, recreational, living, and hospitals. Explain why you have it situated as you have done.

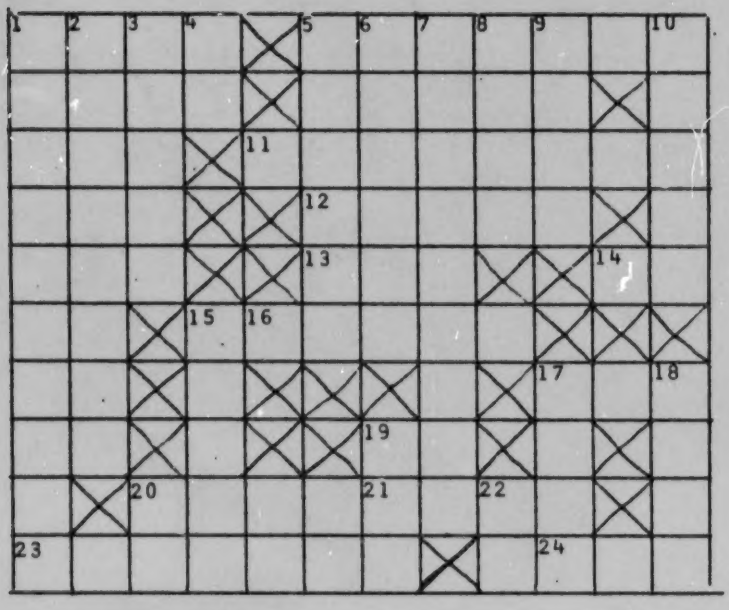


HUMAN ECOLOGY WORDSEARCH

1. ecology
2. nutrients
3. greenbelts
4. fertilize
5. pesticides
6. production
7. waste
8. paper
9. recycling
10. coal
11. petroleum
12. smokestack
13. filter
14. photochemical
15. fission
16. filter
17. birthrate
18. wind
19. solar
20. nuclear
21. energy
22. gas
23. smog
24. deathrate
25. production
26. growth

P	J	L	F	O	B	M	I	P	C	D	E	W	F	G	S	H	S
U	H	J	E	F	I	L	T	E	R	Y	I	S	Q	T	B	X	M
P	D	O	R	V	J	E	N	T	X	N	V	E	N	O	I	T	O
T	E	F	T	B	Z	J	S	R	D	U	I	E	Y	D	R	G	K
A	A	R	I	O	D	C	A	O	H	M	I	T	A	W	T	V	E
O	T	M	L	I	C	A	P	L	X	R	K	Q	P	U	H	Q	S
G	H	W	I	A	G	H	E	E	T	F	A	E	R	H	R	N	T
R	B	R	Z	N	B	R	E	U	U	J	S	S	O	L	A	R	A
O	A	E	E	G	M	K	N	M	H	T	A	C	D	P	T	E	C
W	T	T	P	A	P	E	R	Q	I	R	G	Q	U	M	E	C	K
T	E	L	S	I	N	A	D	C	F	C	W	A	C	M	W	Y	O
H	L	I	C	M	E	H	I	O	Y	I	A	Z	T	S	V	C	N
R	W	F	J	S	Q	D	Z	A	G	O	O	L	I	G	X	L	D
P	A	T	I	K	E	H	F	L	R	S	D	K	O	L	Z	I	M
G	S	D	Y	S	C	W	B	U	E	N	P	Y	N	T	Z	N	T
W	T	X	B	Y	S	M	O	G	N	I	K	Y	C	R	B	G	W
Y	E	U	E	T	L	I	V	Q	E	C	O	L	O	G	Y	J	T
P	F	J	Z	R	S	R	O	R	A	E	L	C	U	N	K	T	F
L	I	D	S	G	R	E	E	N	B	E	L	T	S	V	L	N	S

HUMAN ECOLOGY CROSSWORD PUZZLE



Across

7. what you write on
11. energy type from fission
12. sun's energy
13. personal pronoun
14. opposite of out
16. unwanted product
17. past tense of is
19. leave
20. to get larger
21. picnic pest
23. reminder of a prehistoric reptile

Down

1. energy from hot rocks
2. use again
3. layer of oxygen above earth
4. us
5. short greeting
6. term of relief
7. result of dirty air
8. a space
9. a fruit
10. amount something grows
15. adult male
17. blowing power
18. type of air pollution
19. what cars go on
22. two, too, _____
24. man's best friend

Answers to Human Ecology Crossword Puzzle

Across

7. paper
11. nuclear
12. solar
13. you
14. in
16. waste
17. was
19. go
20. grow
21. ant
23. lizzards

Down

1. geothermal
2. recycled
3. ozone
4. we
5. hi
6. ah
7. pollution
8. area
9. pear
10. rate
15. man
17. wind
18. smog
19. gas
22. to
24. dog

ENERACTIVITY

SOLUTION TO POLLUTION

Objectives: Students will have the awareness that recycling is a means of reusing products and materials to avoid further pollution problems.

1. To help students have awareness that recycling will help some of the pollution problems.
2. To help students be aware that recycling can save.
3. To help students be aware of ways to help keep down pollution.

Procedures:

1. Student & teacher discuss the containers of different products.
2. Students make a list of containers used for foods.
3. Students make a list of containers used for drinks.
4. Students make a list of other containers.
5. Students complete worksheet on recycled recipes.
6. Students complete worksheet on ways to help keep down pollution.

Vocabulary - (Words to look up)

(1) Pollution, (2) Recycle, (3) Substitute, (4) Aluminium, (5) Conserve.

"RECYCLED RECIPES"

Recycling is a means of reusing products and materials to avoid further pollution problems. Below is a list of objects that are not usually reused. Can you think of an alternate product that could be substituted.

Paper Plates
Paper towels
Throw-away bottles
Plastic jars
Paper bags
Plastic wrap
Milk cartons
Tea bags
Kleenex
Plastic silverware
Notebook paper
Cqrdboard boxes
Toothpaste tubes
Aerosol cans
Disposable diapers
Paper napkins

The items that are put in recycleable and non-recycleable containers.

Food	Drinks	Others

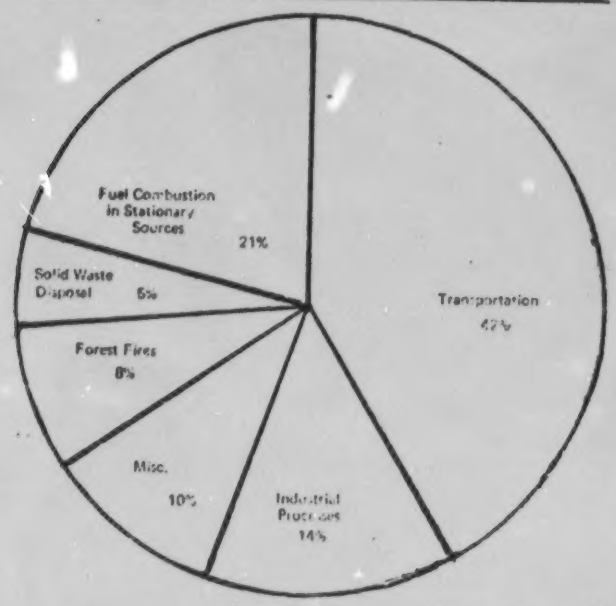
Things to do to help keep down pollution.

READING CIRCLE GRAPHS:

Clean Air or Cheaper Cars?

Reducing clean air standards has been suggested as a way of helping out an ailing auto industry. If fewer pollution control devices are needed, it is argued, the price of a car will be reduced and more people will buy them. Consider the graph below and decide if allowing auto's to pollute more might have an important influence on air quality.

FIGURE 1-4
Sources of Air Pollution



From: National Science Teachers Association, Energy-Environment Source Book, Page 5.

DECISION-MAKING

"Fuels from Waste: Is it an Appropriate Technology for New York City and Southeastern Jersey?"

There have been many recent proposals to use the thirty thousand tons of garbage produced in the metropolitan region surrounding New York City to produce energy. All of these proposals contain arguments for and against building such a large waste-conversion facility. Listed below are the major arguments.

DIRECTIONS: Study the arguments for and against using garbage in the New York-New Jersey metropolitan area. Then answer the questions that follow.

For	Against
1. It is produced in huge amounts	1. Will require enormous amounts of cooperation from two state legislatures and metropolitan authorities, unions, and utilities to name just a few.
2. It is produced right where industry can use it effectively.	2. Not making trash and refuse saves more energy than recycling garbage. (This is the principle of source reduction.)
3. NYC garbage contains mostly dry paper products and plastics which have high, usable energy content, rather than moist organic material such as wet leaves.	3. Local municipal governments would have to continue to pay fees to dispose of their refuse.
4. Landfills are increasingly expensive and hard to find in the region.	4. No one wants a waste-conversion facility in their neighborhood. It's always "Put it somewhere else."
5. Appreciable savings for industrial users of electricity.	5. To become more cost-effective NYC and metropolitan New Jersey would have to "corner" the garbage market on all the burnable refuse. Private companies involved in this market will be deprived of income.
6. Former landfill disposal fees would be used to pay for and maintain plants to burn garbage and convert it to electricity.	
7. Technology for turning waste into electricity is firm.	

QUESTIONS:

1. What appropriate technology is being debated?

2. Which statement presents the best arguments for the appropriateness of converting waste into electricity in the NYC region?

3. Which do you think is the best argument for each side?

4. What other evidence would you find helpful in making up your mind on whether a waste-conversion facility is appropriate for this region?

SOURCE: National Science Teachers Association

ENERSKILL:

PROPAGANDA TECHNIQUES IN ENERGY EDUCATION

Gail Foster

Objective: To identify and to give examples of propaganda techniques for the purpose of building rational decision-making skills.

Sequence of Activities:

1. Teacher will review the rationale and revise hand-outs, if necessary.
2. Students will bring in examples of advertising.
3. Propaganda techniques will be introduced and hand-outs distributed.
4. Students will find examples of each propaganda technique in advertising. Radio & T.V. commercials may be used. Role playing may be valuable.
5. Students will bring in articles on energy.
6. Students will identify specific propaganda techniques within the articles.
7. Group discussion may involve changing values and how they are affected by propaganda.
8. Groups may plan advertising campaigns or write energy articles using propaganda to encourage conservation. Videotape productions could be planned and performed.

Specific Skills:

1. Students will be able to identify specific propaganda techniques in advertisements and commercials.
2. Students will be able to identify specific propaganda techniques in articles based on energy.
3. Students will be able to utilize propaganda to encourage conservation.

Resources:

Advertisements
Energy--related articles
Hand-outs (which follow)

Propaganda Techniques - 1

The Institute for Propaganda Analysis lists seven common propaganda techniques.

1. Name Calling - Applying some label that people generally dislike or fear to a person, organization or idea. Such words as "racist" or "communist" may be used to discredit rather than describe accurately.

   Example - "Only an idiot would believe nuclear power can solve our nation's energy problems."

2. Glittering Generality - Connecting positive - sounding words to an idea, so that you will accept the idea without examining it.

   Example - "Farmers are the life blood of our country, harvesting energy from the sun to feed America. They can help solve our energy problems through gasohol."

3. Transfer - Using the reputation of some respected organization in connection with an idea.

   Example - "The Union of Concerned Scientists estimate that 10 to 17 percent of our uranium miners will die of cancer."

4. Testimonial - Quoting some well-known person in favor of a given product or policy.

   Example - "Energy Analyst Charles Kormanoff recently published an exhaustive study that shows electricity from nuclear plants will cost 20 to 25 percent more than power from modern coal plants with advanced pollution - removing scrublers."

5. Plain Folks - Winning confidence on the basis that an idea is good because it is related to the common people.

   Example - "Ladies and gentlemen of the jury, the defendant cannot possibly be guilty of tampering with his electric meter to defraud the utility company, for he comes from a long, long line of hard-working, God-fearing, liberty-loving, and patriotic people just like yourselves.

6. Card Stacking - Selecting and using facts to give a false or misleading idea.

   Example - "Nuclear plants in the U.S. run at only 5 percent of their capacity."

7. Band Wagon - Urging you to follow the crowd and accept the idea because "everybody's doing it."

   Example - "... meeting the nation's energy needs should be a great national cooperative effort that enlists the imagination and talents of all Americans."

Propaganda Techniques - II

1. Appeal to Pity - Seeks to produce sympathy and pity to influence your opinion.

   Example - "America's poor, already trapped by rapidly rising prices for food and housing, are expected to be hardest hit by a 50¢ a gallon tax on gasoline."

2. Appeal to Prestige - Urging the acceptance of an idea as a means of raising your status.

3. Appeal to Ridicule - Attempting to make fun of someone or something in order influence your opinion.

   Example - "Conservation is ignored in the President's energy budget. Obviously, conservation is not good business for the oil companies that donated $280,000 to redecorate Ronald Reagan's White House living quarters."

4. Bargain Appeal - Attempting to get you to buy an item by appealing to your desire to save money.

   Example - "This is your last chance to buy a brand new Opex automobile at 1981 prices."

5. Appeal to Flattery - Attempting to persuade by flattering a person in an area in which he would like to excel.

   Example - "Physically fit students tend to use bikes for transportation in order to conserve our valuable natural resource."

6. Slogan Appeal - Promotes a favorable response or positive action through shorth, catchy phrases.

   Example - "Save It, Florida." "Extinct Is Forever."

7. Technical Jargon Appeal - Impresses with the use of technical language or unfamiliar words.

   Example - "Durawear tires contain durium, the bonding material that makes these tires wear for years."

8. Danger/Survival Appeal - Refusing to act in a certain manner will result in harmful consequences.

   Example - "The Union of Concerned Scientists predicts a one-in-five chance of a catastrophe for one of our current reactors during their 30 to 40 year lifespan."

Sources - Some examples were based upon an article in the Tallahassee Democrat entitled "We Don't Need Nuclear Power" by Ira Scorr, June 21, 1981.

V ENERACTIVITIES

ENERGY IN OUR LIVING

ENERACTIVITY

Heat, Fire, Electricity

Objective: This lesson conveys to the student how heat is produced and what we use electricity for.

Students should be able to:

1. Describe how heat is made and what the chemical change involved is.
2. Explain how electricity is necessary to our lifestyle.
3. Make a home energy investigation chart, conserve energy at home..

Materials: Candle, glass bowl, electric heating pad, paper, stick matches.

Activity 1

How is heat produced?

Procedure: Light a candle and burn paper and match sticks. What happens to the paper?

Teacher's Summary

All fires produce heat. The substance that burns to produce heat is called fuel. The common fuels contain carbon. Carbon is necessary for burning. Air containing oxygen is also necessary for burning.

When any fuel burns the oxygen in the air unites with the carbon of the fuel. Heat results and carbon dioxide a new substance is formed. A chemical change has taken place.

Activity 2

How does heat from electricity differ from the heat from fires?

Procedure:

1. Light a candle
2. Cover the candle with an inverted glass bowl. What happens?
3. Light the candle again and let it burn until it is consumed. What happens?
4. While the candle is burning connect the heating pad with electric current. When the pad is warm, cover it with an inverted glass bowl. What happens? Take bowl off and leave the pad connected with current. What happens?

Teacher's Summary

The candle went out when its supply of oxygen was shut off by the overturned bowl. The candle burned with oxygen until there was nothing left of it. The electric heating pad was not affected by the overturned bowl and because of electric current continued to stay warm as long as it was plugged in.

Conclusions

One advantage in heating a house or in using electricity in cooking is cleanliness. No carbon dioxide, ashes, smoke, or dirt appear.

Home Energy Investigation Chart

Directions:

Be a detective and help conserve energy in your home. First check the column for use in the home. Next mark the column for importance to you and your family. Add any appliance that is not already listed. When you are finished go back and check the column labeled, "Can I conserve energy here?" Bring your paper to school and discuss your findings with your class. Be sure to share your findings with your family and practice saving energy.

ist Gas or ctric ppliance	Health Cleanliness	U S E Comfort Convenience	Entertainment	Number in Home	Can I Conserve Energy Here?	Can't Live Without	I M P O R T A N C E Important	Semi-important	Little Importance	Luxury	✓ appropriate box
ir Conditioner											
nder											
an opener											
othes washer											
lothes dryer											
ffee pot											
lock											
rlers											
urling iron											
rn popper											
ishwasher											
n											
reezer											
ying pan											
arbage disposal											
ater											
ron											
crowave oven											
adio											
nge											
efrigerator											
ereo											
V.											
cuum cleaner											
ater heater											

HOME ENERGY INVESTIGATION

ENERACTIVITY

The Electric Light Bulb

Objectives: To make students aware that work, pleasure and culture are possible through light. Light is a form of energy. By modern devices, artificial light is produced and can be distributed so that the eye uses it to the best advantage and without injury. Eyes should be protected from too much or too little light. Energy should be conserved.

-- To develop the childrens' awareness of electricity in every day life.

-- To increase the childrens' awareness of the various things electricity does for us in school, home and the community.

-- To show the importance of electricity in giving us light as well as other things.

-- To develop the basic concepts of electricity as to how it works and what goes into its production.

-- To help children acquire certain habits of conservation in relation to electricity.

Vocabulary (Words) to look up):

Conserve,bulb, energy, electricity, voltage, transformer, power station, socket, magnets, magnetic field, electric current, fuel.

Materials: Dry cell, bulb, switch, newspapers, magazine, construction paper, crayons, spirit paper, scissors.

Procedure:
1. Students look up information on Thomas Edison and give a report on his contribution to electricity by his invention of the light bulb.
2. Students make a list of places in the school building and neighborhood where light bulbs are used.
3. Students make scrapbooks from pictures obtained from newspapers and magazines illustrating the different things that are lit up by light bulbs.
4. Have discussions of what has been learned about electricity and the light bulb.
5. An experiment connect a dry cell to a bulb to make it light up.
6. An experiment using a dry cell, bulb and switch to show how the light bulb goes on and off.
7. Students make a list of ways energy can be conserved.

Places where the electric light bulbs are used.

School	Neighborhood

METER READING

Ojbjective:
1. To read an electric meter
2. To compute the number of KWH used when given reading from beginning to end of alloted time.

Materials: Handouts, 2 sets of meter cards (mimeograph)
Materials on how to read a meter
Materials on how to figure KWH

Procedure: Elect time to read meter (weekly). Make sure children understand which number meter is on. Make sure children read meter in correct direction. Tell children when pointer is between numbers you record the smaller number.

Problems:
1.) Match meter readings that teachers have made up.
2.) Have children read meters at home on Tuesday of 2 following weeks and record them again 1 month later.
3.) Teach children to read meters by place valve.
4.) Write meter readings as standard and expanded numerals.
5.) Record date and time of specific meter reading
6.) Write what you feel might have caused you to use more or less 1 month than the other.
7.) What can you do to descrease your electric bill.
8.) Figure the price of electricity used in a week by multiplying KWH by 6, or whatever number is used.

ENERACTIVITY

YOUR UTILITY DOLLAR

Objective: Webster's dictionary defines a utility as an organization that sells a service to a community. The local utility is a commission that provides electricity, water, sewage and garbage services to the citizens of the community. For this they assess a charge based on the amount of electricity and water the customer consumes.

In this lesson we will take a look at our usage of the services of the utilities commission and the price we pay for such services. Basic mathematical computations will be reinforced as we subtract the current readings for electricity and water from that of the previous month and then divide to ascertain the cost per kilowatt hour of electrical energy and the cost per hundred gallons of water used.

The use of graphs to depict the various findings will reinforce the students use of bar graphs and provide a visual picture of the comparison of the costs' involved.

Materials: Needed will be copies of two Utilities Commission statements with a one month interval between the two. Graph paper.

Notation of abbreviations used on statement:

EL - Electricity
WA - Water
SW - Sewage
GB - Garbage
CT - City Tax

Procedure: A general discussion of the statement.

Determine the amount of electrical energy consumption by subtracting the previous reading from the current reading. Repeat this for the second statement.

Ascertain the rate of charge by dividing the cost by the number of kilowatt hours used. Repeat this for the second statement.

Follow the same procedure to compute the amount of water used and the cost per unit.

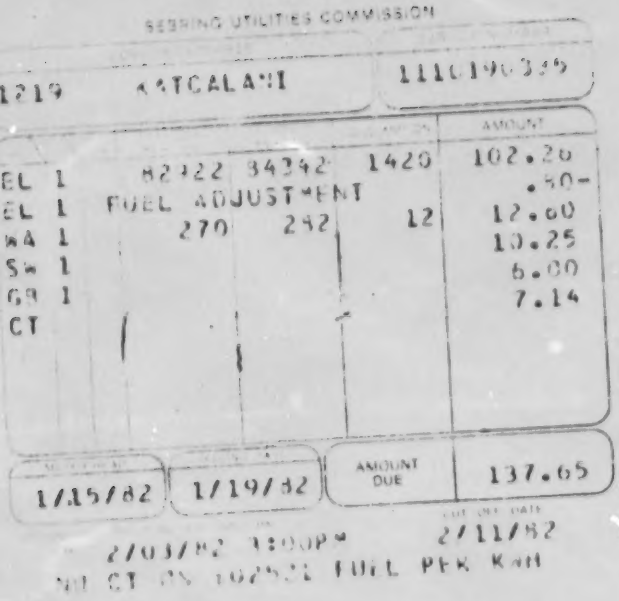
Note that the sewage disposal charge appears to be constant as does the charge for garbage pickup.

Discuss the effect the city tax has on the actual rate per kilowatt hour you pay for the electricity used.

Students will graph the November and January kilowatt hours and cost of electricity then do the same for the use and cost of water.

Students will then determine the dollar percentage cost of electricity, water, sewage, garbage, and city tax and construct a graph to depict this fact. A circle graph would be the better way to demonstrate this fact. This can be done for each of the statements used.

A challenge can be issued to the better student to determine how much the missing December utility bill was and that fact can then be converted to the graphs. They will note that sewage and garbage appear to be constant but electricity, water and city tax will increase or decrease depending upon the amount of that months usage of these resources.


SEBRING UTILITIES COMMISSION

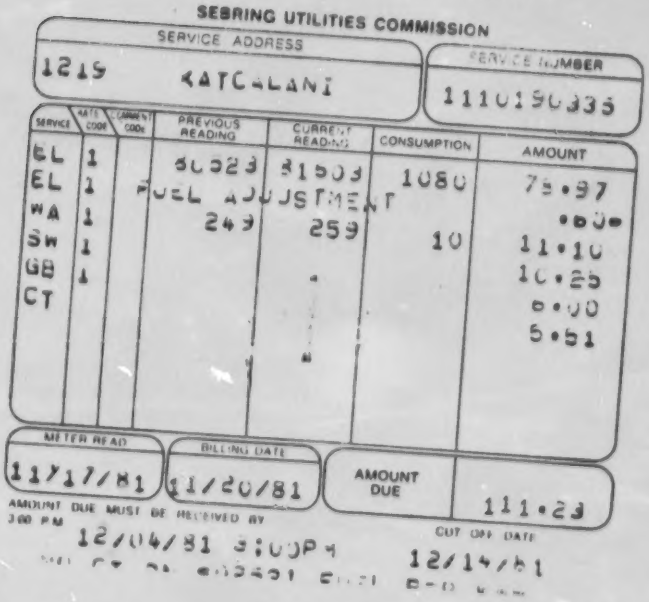
1219 KATCALANI 1110190335

					AMOUNT
EL	1	82422	83842	1420	102.20
EL	1	FUEL ADJUSTMENT			.50-
WA	1	270	282	12	12.00
SW	1				10.25
GB	1				6.00
CT					7.14

METER READ	BILLING DATE	AMOUNT DUE	137.65
1/15/82	1/19/82		

2/03/82 3:00PM 2/11/82

CT ON 102521 FUEL PER KWH


SEBRING UTILITIES COMMISSION

SERVICE ADDRESS: 1219 KATCALANI

SERVICE NUMBER: 1110190335

SERVICE	RATE CODE	ADJUSTMENT CODE	PREVIOUS READING	CURRENT READING	CONSUMPTION	AMOUNT
EL	1		80323	81503	1080	75.97
EL	1	FUEL ADJUSTMENT				.60-
WA	1		249	259		
SW	1				10	11.10
GB	1					10.25
CT						6.00
						5.51

METER READ	BILLING DATE	AMOUNT DUE	111.23
11/17/81	11/20/81		

AMOUNT DUE MUST BE RECEIVED BY 3:00 PM 12/04/81 3:00PM CUT OFF DATE 12/14/81

CT ON 102521 FUEL PER KWH

Kilowatt Hours Used

1500
1475
1450
1425
1400
1375
1350
1325
1300
1275
1250
1225
1200
1175
1150
1125
1100
1075
1050
1025
1000

Nov. ? Dec.

Cost of Electricity

$110.
108.
106.
104.
102.
100.
98.
96.
94.
92.
90.
88.
86.
84.
82.
80.
78.
76.
74.
72.
70.

Nov. ? Jan.

November
$ Percentage of utility usage

100%
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5

Electricity Water Sewage Garbage City Tax

Water Used
(gallonage in hundreds)

15
14
13
12
11
10
9
8
7
6
5
4
3
2
1

November Statement ? January Statement

Cost of Water

$15.00
14.50
14.00
13.50
13.00
12.50
12.00
11.50
11.00
10.50
10.00
9.50
9.00
8.50
8.00
7.50

November Statement ? January Statement

December
$ Percentage of utility usage

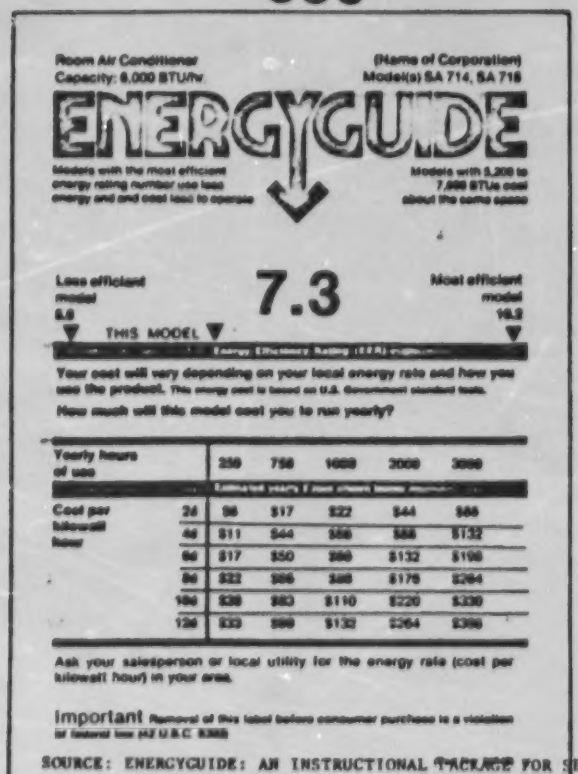
100%
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5

Elect. Water Sewage Garbage City Tax

ENERGY ERROR:

Mutt and Jeff were in the market for a new room air conditioner. They went to almost every store in town, looking at air conditioners! Finally, their choice comes down to the models below. Jeff wants to save money and argues for the purchase of the $300.00 model. Mutt likes the color of the $350 model and wants to buy it. Which one, Mutt or Jeff, made an energy error (or did both make an error?) Explain your answer.

$350



Room Air Conditioner
Capacity: 6,000 BTU/hr.

(Name of Corporation)
Model(s) SA 714, SA 716

ENERGYGUIDE

Models with the most efficient energy rating number use less energy and cost less to operate

Models with 5,200 to 7,800 BTUs cool about the same space

Less efficient model 5.8 — THIS MODEL — 7.3 — Most efficient model 10.2

Energy Efficiency Rating (EER)

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

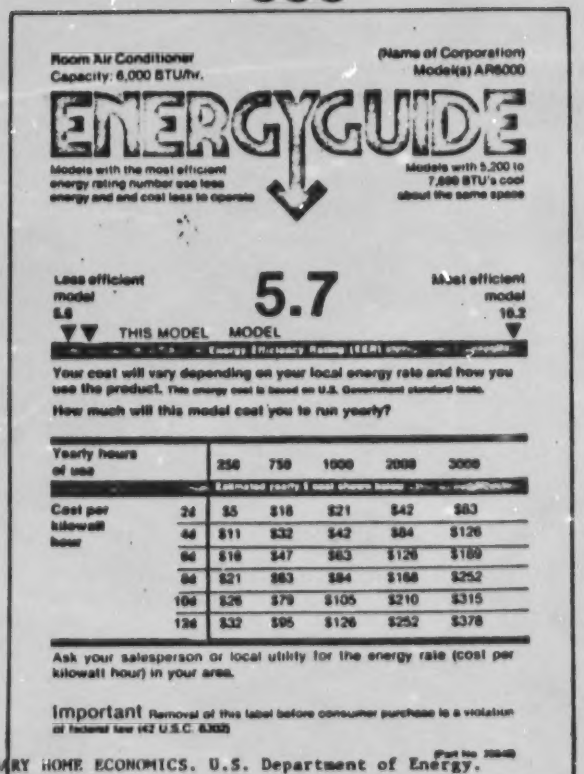
How much will this model cost you to run yearly?

Yearly hours of use		250	750	1000	2000	3000
		Estimated yearly $ cost shown below				
Cost per kilowatt hour	.04	$6	$17	$22	$44	$66
	.08	$11	$44	$66	$88	$132
	.12	$17	$50	$66	$132	$198
	.16	$22	$66	$88	$176	$264
	.100	$28	$83	$110	$220	$330
	.120	$33	$99	$132	$264	$396

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

$300



Room Air Conditioner
Capacity: 6,000 BTU/hr.

(Name of Corporation)
Model(s) AR6000

ENERGYGUIDE

Models with the most efficient energy rating number use less energy and cost less to operate

Models with 5,200 to 7,800 BTU's cool about the same space

Less efficient model 5.8 — THIS MODEL — 5.7 — Most efficient model 10.2

Energy Efficiency Rating (EER)

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly hours of use		250	750	1000	2000	3000
		Estimated yearly $ cost shown below				
Cost per kilowatt hour	.04	$5	$16	$21	$42	$63
	.08	$11	$32	$42	$84	$126
	.12	$16	$47	$63	$126	$189
	.16	$21	$63	$84	$168	$252
	.100	$26	$79	$105	$210	$315
	.120	$32	$95	$126	$252	$378

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

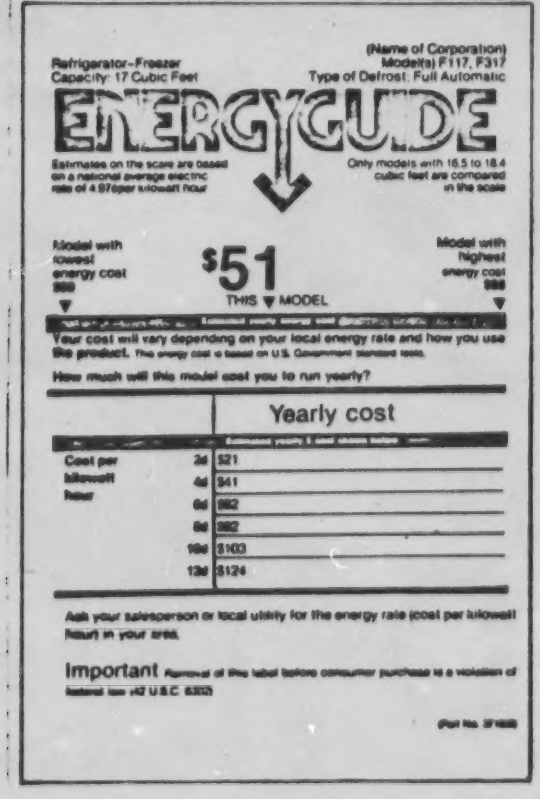
SOURCE: ENERGYGUIDE: AN INSTRUCTIONAL PACKAGE FOR SECONDARY HOME ECONOMICS. U.S. Department of Energy.

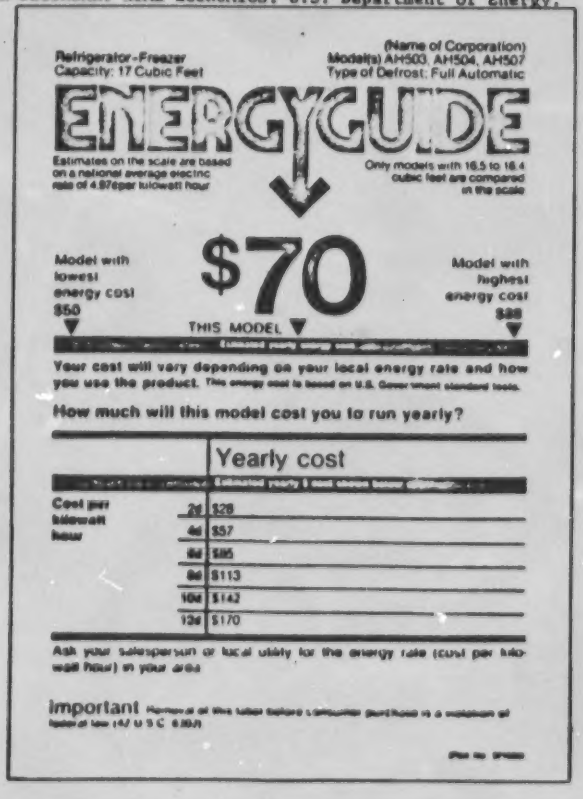
ENERGY ERROR: Rod and Carol Turner noticed that their refrigerator was aging. The paint was peeling, the motor laboring, and the noise increasing. They shopped around for a new refrigerator/freezer using the cost and the EER (Energy Efficiency Rating). Rod and Carol decided to buy Model B (see below) rather than Model A. Obviously, they saved money. But will they save energy over the life of this new refrigerator? Did they make an energy error?

MODEL A
Cost: $545.00

MODEL B
Cost: $485.00

SOURCE: ENERGYGUIDE: AN INSTRUCTIONAL PACKAGE FOR SECONDARY HOME ECONOMICS. U.S. Department of Energy.


Refrigerator-Freezer
Capacity: 17 Cubic Feet
(Name of Corporation)
Model(s) F117, F317
Type of Defrost: Full Automatic
ENERGYGUIDE
Estimates on the scale are based on a national average electric rate of 4.97¢per kilowatt hour
Only models with 16.5 to 18.4 cubic feet are compared in the scale
Model with lowest energy cost
$51
THIS MODEL
Model with highest energy cost
Your cost will vary depending on your local energy rate and how you use the product.
How much will this model cost you to run yearly?
Yearly cost
Cost per kilowatt hour
2¢ $21
4¢ $41
6¢ $62
8¢ $82
10¢ $103
12¢ $124
Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.
Important


Refrigerator-Freezer
Capacity: 17 Cubic Feet
(Name of Corporation)
Model(s) AH503, AH504, AH507
Type of Defrost: Full Automatic
ENERGYGUIDE
Estimates on the scale are based on a national average electric rate of 4.97¢per kilowatt hour
Only models with 16.5 to 18.4 cubic feet are compared in the scale
Model with lowest energy cost
$50
$70
THIS MODEL
Model with highest energy cost
Your cost will vary depending on your local energy rate and how you use the product.
How much will this model cost you to run yearly?
Yearly cost
Cost per kilowatt hour
2¢ $28
4¢ $57
6¢ $85
8¢ $113
10¢ $142
12¢ $170
Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.
Important

RESIDENTIAL ENERGY CHECKLIST

HOUSE: The Shell	YES	NO
1. Are plants properly located around the house to provide a break against wind and shade against unwanted sun?		
2. Are drapes and furniture located so they do not obstruct heating, air-conditioning or ventilation?		
3. Are draperies insulated?		
4. Do draperies fit snugly around the window?		
5. Are exterior house doors closed quickly after use		
6. Are lights and appliances turned off after use?		
7. Do you have storm windows and doors?		
8. Are all doors and windows properly caulked and weatherstripped?		
9. Are draperies and shades closed at night and on cloudy, windy days during the heating season?		
10. Are draperies opened to admit sunlight on sunny days in the heating season?		
11. Are draperies and shades closed on sunny days during the cooling season?		
12. Is the attic ventilated?		
13. Is the attic insulated to 6-8"?		
14. Are the walls insulated?		
15. Do floors exposed to unheated or cooled air have from 2-3½" of insulation?		
16. Is the fireplace damper closed when not in use?		
17. Is the den, gameroom or family room oriented to the south?		
18. Is the house shaded from the western sun?		

	YES	NO
19. Does your home have window area equivalent to 10% or less of its square footage?		
20. Is your home sealed from drafts? Is it free from cracks and holes?		
21. Does your home have fluorescent lighting where appropriate?		
22. Does your home have wall-to-wall carpeting?		
23. Do all windows have drapery, shades, blinds, shutters or other covering?		
ENVIRONMENTAL CONTROL		
24. Are ducts, radiators or air-conditioners closed off in unused rooms or closets?		
25. Are hot water pipes insulated in unheated and uncooled spaces?		
26. Are air ducts insulated in unheated and uncooled spaces?		
27. Is the thermostat set at 65 degrees F or below during the heating season?		
28. Is the thermostat set at 78 degrees F or above during the cooling season?		
29. Are heating and cooling filters clean?		
30. Is the thermostat turned back at night?		
31. Are windows and doors tightly closed while machanically heating or cooling?		
32. Is an attic fan used in the summer?		
33. Do thermostats indicate correct temperature settings?		
34. Is an outside air-conditioning unit located on the shady (north) side of the house?		
35. Is the water heater insulated?		
36. Is the water heater temperature setting at 140 degrees F or less?		

	YES	NO
37. Is the air-conditioning unit properly sized for your needs?		
38. Do you have a heat pump?		
39. Do you use natural ventilation as much as possible?		
40. Are rediators and other heating or cooling equipment clean and dust free?		
41. Is the water heater located in a heated space?		
HOUSING SELECTION		
42. If you live in an apartment, is it an "inside" apartment?		
43. If you live in a mobile home, does it have a "skirt"?		
44. If you live in an older home, have its plumbing, wiring, insulation and chimneys been checked by "experts"?		
FOOD		
45. Is the frost on the refrigerator and freezer less than ¼ inch thick?		
46. Is the refrigerator set at 40 degrees F?		
47. Is the freezer set at 0 degrees F?		
48. Are gaskets around refrigerators and freezers tight?		
49. Is the oven used to bake more than _____food at a time?		
50. Is the gasket around ovens tight?		
51. Are frozen foods thawed completely before cooking?		
52. Is the cooking range turned off immediately after use?		

62

	YES	NO
53. Are dishes washed only when there is a full load?		
54. Are dishes allowed to air dry?		
55. Are appliances clean and dust free (particularly cooling coils)?		
56. Is the oven never used as a dryer or heater?		
57. Are flat bottom pots and pans used?		
58. Is a timer used to avoid over-cooking?		
59. Are pots covered during cooking?		
60. Is as little water as possible used during cooking?		
61. Is the heater dry cycle on the dishwasher not used?		
CLOTHING		
62. Does your family dress warmer in cool weather to avoid mechanical heating?		
63. Does your family dress cooler in warm weather to avoid mechanical cooling?		
64. Are clothes washed only when there is a full load?		
65. When washing is cold or warm water used when possible?		
66. Are clothes line dried when possible?		
67. Are most of your family's clothes wash-and-wear, permanent press to avoid dry cleaning and ironing?		
68. Are clothes always rinsed with cold water?		
69. Is the washer located near the water heater?		
70. Is the dryer lint screen cleaned after each load?		

	YES	NO
PERSONAL CARE		
71. Do the members of your family take short shower or use only small amounts of water for tub baths?		
72. Are all water faucets repaired and not leaking?		
73. For washing, shaving or make-up is the lavatory filled rather than allowing water to run?		
ENTERTAINMENT		
74. Are entertainment devices turned off when not in use?		
75. Do members of your family try to entertain themselves rather than rely on devices?		

-- If you answered with 65 or more yes's, you are truly an energy conserver and will make a good conservation advocate.

-- If you answered with 55 to 65 yes's, you are energy conscious but lack will-power or drive.

-- If you answered with 45 to 54 yes's, you are wasting energy but with minor changes could make a conserver.

-- If you answered with 35 to 44 yes's, you are an energy waster and should make an all-out effort to reform.

-- If you answered with less than 35 yes's, you are making an effort to waste energy and should consider the long range and immediate effects!!

SUGGESTIONS:

1. Distribute these checklists school-wide.

2. Try a before and after approach to using the checklist. Check before your conserving effort and after.

3. Survey students to see if their families are generally conservative or not.

School Energy Audit

Objective: The purpose of this audit is to make students, teachers and ALL staff members aware of the energy use of the school plant and particulary their specific area. Home energy use will also be discussed which will involve the interest of the teachers and staff.

Step # 1 Choose a family high ability group who will calculate and help carry out the energy audit. Students will check the school's energy consumption by reading the meter and by reviewing past bills, establish an average usage in KWH.

Step # 2 Meet with the entire faculty and staff to demonstrate "The Watt Watcher" demonstration box. (see procedure in manual). Distribute residential energy checklist which will help to get individuals to be "Energy Aware!" Distribute energy audit forms and instruct how to use them. (If records are available, discuss the energy costs for your school)

Step # 3 Students will gather information and calculate school energy use. (The next bill will reflect energy conservation methods, see sheet)

Step # 4 Implement energy conservation ideas for 1 month and compare weekly readings with post conservation average. (Weather changes or extremes can effect weekly consumption tremendously).

Step # 5 Report findings of aduit to entire school and try to continue conservation methods.

Energy Audit Form

Please list carefully all electrical devices in your room or work area. Be sure to check storage areas etc. Watts, AMPS or H.P. can be found on motirs, A/C units etc. List what information is known, and the electrical consumpsion will be calculated by the audit team. Please put down estimated hrs/mo of usage in all areas.

1.) Flourscent Tubes _____ (No Tubes) x _____ (watts each) = _____ (Total watts) x _____ (Hrs./mo.) = _____ (Total)

2.) Incandescent Bulbs _____ (No Bulbs) x _____ (Watts each) = _____ (Total watts) x _____ (Hrs./mo.) = _____ (Total)

3.) Additional Lighting Information:

_____ (Total)

4.) A/C _____ (Thermostat of) x _____ (No. Units) x _____ (Rating Watts) = _____ (Total Watts) x _____ (Hrs./mo.) =

_____ (Total)

5.) Heating _____ (Thermostat of) _____ (No Units) x _____ (Rating Watts) = _____ (Total Watts) x _____ (Hrs./mo.) =

_____ (Total)

* (If you are part of a central system indicate below)

6.) Additional Heating/AC information:

7.) List any additional electrical equipment below individually

_____ (Hrs./mo.) _____ (Total)

Total Watt/Hrs _____ / 1000

KW/Hrs/mo. _____

Conservation Ideas For Schools

1.) Turn off 1 row of lights or more if possible.

2.) Use shades or curtains to control solar heat gain.

3.) If individual A/C - Heat units are used, use them when needed and set A/C on 78 degrees - Heat on 68 degrees. If windows are present use them when appropriate.

4.) Cafeteria can serve a "cold plate" lunch weekly or more often if possible.

5.) Turn lights off in unoccupied areas.

6.) Turn water heaters down (cafe is set by law)

7.) Keep A/C filters clean.

VI ENERACTIVITIES:
ENERGY IN SCIENCE

ENERACTIVITY

LARGE NUMBER CONCEPTS

Objective: To help students understand and deal with large numbers which have particular application to discussions or lessons on populations, energy uses (amounts) used. etc.

Procedure: Pupils are instructed to mark as many groups of tally marks as physically possible in one minute. The teacher will be timekeeper for starting and stopping times.

Students are instructed to count total marks made after one minute and are to use this number for making a determination of several large numbers such as: 1,000 or 1,000,000 or 1,000,000,000.

This lesson has many applications in the energy area in dealing with populations, resources, energy, budgets, etc.

ENERACTIVITY

FINDING A CALORIE OF ENERGY

Objective: Giving experience to pupils in finding a unit of energy expressed as a calorie

Materials:
Frozen orange juice can
Date tables
Hardware cloth, 6"x12" for burner stand
Several birthday candles
Dual scale thermometers for each team.
Matches for each team.
Wooden blocks for safety in handling candles

Procedure: Team of students(2) will measure increases in temperatures produced by a birthday candle on water and record in data table. Figures in data table are used to determine calories of energy in the heated water. Formula for calorie is 1 gram of water heated 1 degree celcius.

Students learn to manipulate equipment, determine caloric values and experience record keeping, reading a thermometer and keeping accurate time.

Data Table

Grams of Water	Beginning Temp.°C	After 1 min °C	After 2 min°C	After 3 min °C
100 g				
150 g				
200 g				

ENERACTIVITY

How Does The Type Of Material Affect Absorption Of Solar Energy

Objective: To show that type of materials affect solar energy absorbed.

Materials: 4 glasses of equal size, 4 thermometers, soil, water, cotton.

Activity: Put jars in sunlight. Put a thermometer in each of jars. Fill the first jar with soil, second with water, third with cotton, 4th with no materials (ask children if it is empty.)

Have students set up a data chart and record beginning temperatures. Leave jars in sun for an hour and record temperatures at 10 minute intervals. Evaluate findings at the end of hour. Which material showed the greatest temperature gain? Which showed the least?

Variation: Find out which material allows the most rapid heat loss. Place jars in a cool shady area. Record temperatures for next hour at 10 minute intervals. Record on data chart. Evaluate recordings. Which material lost the most amount of heat? Which lost the least?

1 Hour Observation	Temperature Recordings in °C			
Time	Soil	Water	Cotton	Air
1. Beginning Ten				
2. 1st ten min.				
3. 2nd ten min.				
4. 3rd ten min.				
5. 4th ten min.				
6. 5th ten min.				
7. 6th ten min.				

Extending the Lesson:

1. Have students give their explanations as to results of experiments.

Science - 5-6th Grades

Do plants grow better with different colors of reflected light?

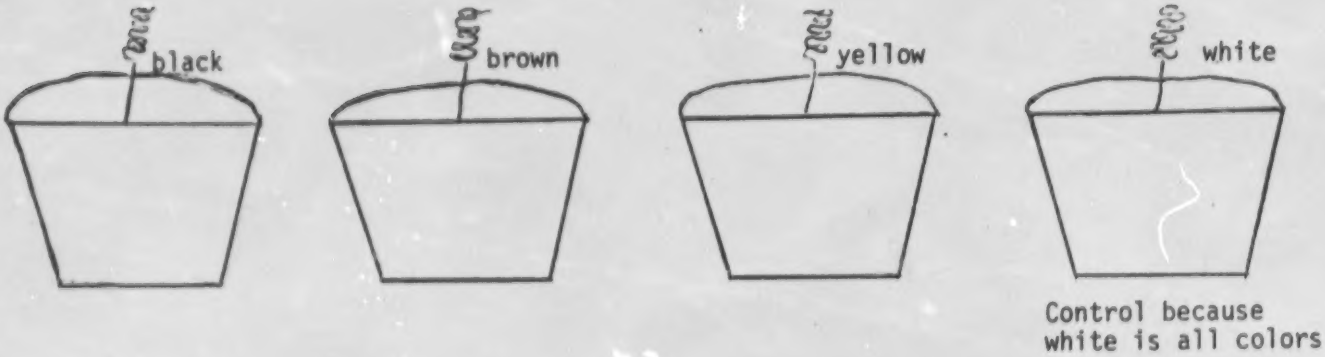
Objective: To show the effects of dark and light colors on plant growth.

Materials: 4 pie plates with holes in center, 4 different colors of paint black, brown, yellow, white, 4 bean plants of equal size.

Introduction of Lesson

1. Define photosynthesis
2. Ask students to bring plant pictures into classroom as primary sources of energy.

Activity: Paint 4 pie plates with 4 different colors. Take 4 bean plants and place each pie plate over pots.



Control because white is all colors

Place plants in a sunny place. Water at the same time each day by carefully lifting pie plates from side (Be sure to give equal amounts of water) Observe the growth rate of each plant over a 2 week period.

Observation Charts

Date	Observation

72

ENERACTIVITY

How Does Insulation Work

Objective: To show that insulation slows down the movement of heat from the inside of an object to the outside.

Materials: A small water glass. An inexpensive "fish tank" thermometer. A cardboard box (find one made out of corrugated cardboard; it should be just big enough to hold the water glass). A handful of cotton balls (you can obtain these at most local stores). You will need a refrigerator to place the water in. This experiment could be done using different types of insulating material to find their effectiveness.

Procedure:

1. Fill the glass with water and use thermometer to measure the exact temperature of the water in the glass.
2. Place the glass of water and thermometer in a refrigeator. Check the temperature of the water every 5 minutes (usually the water temperature will drop 3 to 4 degrees every 5 minutes).
3. Allow the glass a few minutes to return to room temperature before refilling the glass with water at room temperature.
4. Place a layer of cotton balls inside the bottom of the cardboard box. Set the glass of water on top of the layer of cotton balls. Pack cotton balls in the empty space between the glass and the sides of the cardboard box.
5. Place the cardboard box in the refrigerator. Be sure to check the temperature of the water every 5 minutes. The rate of heat loss should slow down.
6. The water temperature should drop slower (usually about 1 or 2 degrees every 5 minutes).

Understanding what has taken place in the experiment.

1. Have students explain why the insulated glass container did not lose heat as quickly as the non insulated glass container.
2. Have students explain why insulation can reduce the amount of fuel needed to heat their homes.
3. Have a discussion with the students on different types of insulators used in homes.
4. The experiment could be done using different types of insulating materials. A chart could be made by students to show their effectiveness.

This experiment could be done using heat from the sun instead of a refrigerator. In this case thermometers should be shaded for an accurate temperature reading. This would show how insulation can help keep a home cool in the summer.

Idea of experiment was obtained from the:
Thomas Alva Edison Foundation
Cambridge Office Plaza, Suite 143
18280 West Ten Mile Road
Southfield, Michigan 48075

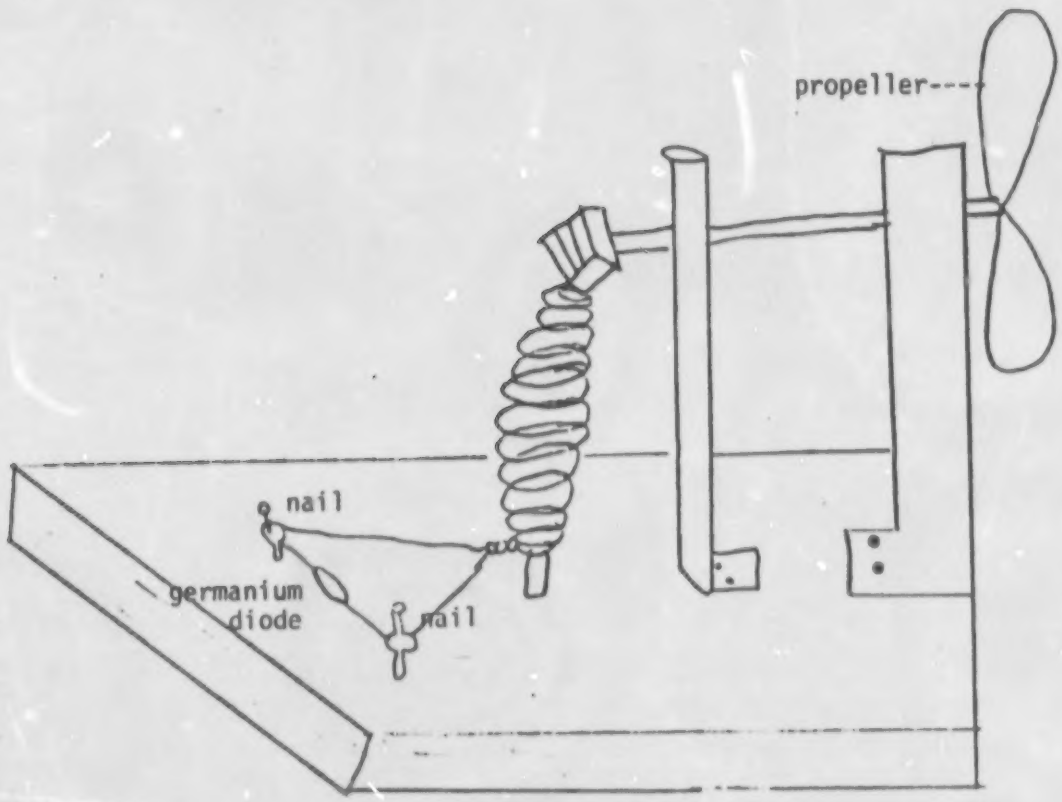
This experiment can be set up for three forty five minute periods. The first day is used to discuss procedure with the class. The second day is used to allow students to do the experiment with cotton balls or an insulator of their choice. The thrid day is used for organizing materials, conclusions, and graphs.

Conversion of Wind Energy to Electrical Energy

Objective: By the prcpeller spinning a small amount of current will be produced.

Materials: Model airplane propeller about 6" long. Two nails 1" long, two nails 3" long, four small nails. Small bar magnet 1" long, two metal strips 1½" by 4" cut from a tin can. Magnet wire from experiment 2. Germanium diode type IN34A (most electronics stores carry this inexpensive part). Tape, glue, soldering iron and solder. Wood block about 3½" by 5". The galvanometer you made in Experiment 2.

Procedure: To make the wind generator, begin by wrapping 1000 turns of magnet wire around one of the large nails. The coil should be 2" long, measured from the head end. Leave a few inches of wire for connections. Twist them so they won't unravel. Drive this nail into the center of the wood block. Also drive in the two smaller nails where shown.
After scraping the enamel insulation off the ends of the coil wires wrap the bared ends around the nail heads, then hook the diode across the nails and make all connections secure by soldering.
Next, glue the bar magnet to the head of the other large nail. Be sure the magnet is centered on the head and the glue is given plenty of time to set. This will be our propeller shaft.

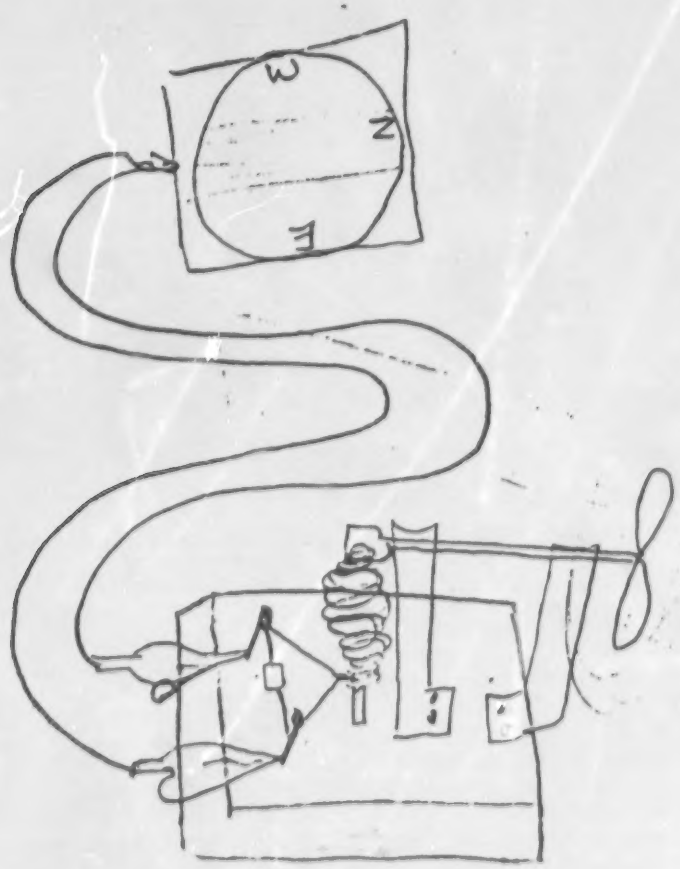


The shaft is supported by the two tin-can strips. Fold them in half engthwise for added stiffness. Then blend about 3/4" for the base, nail them to the wood block, in line with the upright nail.

You'll have to decide how high the shaft holes should be. Locate the holes so the magnet ends are close to the upright nail head yet not prevent the haft from spinning freely.

Insert the shaft in the supports till the magnet is directly over the nail ead. Two collars of electrical tape will keep the shaft in place. Finally, drill hole in thepropeller so that it fits snugly on the nail. Now for the test. Connect the galvanometer's alligator clamps to the nail terminals. Keep the compass about a oot away from the magnet. Again, as in Experiment 2, have the galvanometer coil lined p with the compass needle.

Set the generator in the wind or in front of a fan, (or wrap a couple feet f string around the shaft and pull upward, like trying to start a power lawn mower). When the shaft turns you'll see the compass needle deflect. This demonstrates that lectricity can be produced from the wind.



ENERACTIVITY

Recycling Waste to Produce and Conserve Energy

Objectives:

--Students will be able to convert paper waste products into heat.

--Students will be able to state how wastes provide us with needed energy.

--Students will be able to state other ways of disposing of waste usefully.

Materials: Different types of paper, 2 aluminum pie pans, water, scissors.

Procedure I:

1. Prepare the below experiment ahead of time so it has time to dry.
2. Brain storm for different types of waste paper.
3. Using scissors, cut paper waste into pieces and place into pie pan.
4. Soak paper in warm water until it is soggy.
5. While paper is soaking, line the second pie pan with aluminum foil to keep it clean.
6. Place layer after layer of soggy paper into the dish.
7. Use fingers to press the layers together and to force the excess water out, pour excess water off.
8. Stop adding layers when you have built a pile about 3/4 inch thick.

   Now let the compressed pile dry. To speed up process use earlier prepared dried paper to finish demonstration.
9. Lift pile out of dish, break into chunks.
10. The chunks of this salvage waste paper will burn like wood.

Procedure II:

Brainstorm for various types of wastes found in the home (list these on the board according to the below and than discuss the below)

1. Conserving energy needed to form glass from its raw materials - this is accomplished by reusing glass containers.
2. Conserving energy needed to separate aluminum from its raw materials, a. melt down existing containers and reform, b. sterilize and reuse some existing containers.
3. Conserving energy needed to separate iron ore and still: a. melting down existing iron and still and reforming it.
4. Conserving energy and natural resources, a. reusing and recycling existing paper products.
5. Conserving energy and natural resources by using organic waste materials for fertilizers and fuel. examples - vegetation, animal waste.

ENERACTIVITY

Fuel From Fruit

Objective: To demonstrate the way energy from the sun is stopped in plants

This activity demonstrates the ability to obtain burnable fuel from fruit (oranges in my case).

Materials: plastic milk jug, glass jar, rubber tubing, distilling apparatus, oranges (or other fruit), activated yeast, stopper (1 hole)

Procedure:

1. Cut up fruit and juice
2. Put in milk jug
3. Add 1 qt. hot water and activated yeast
4. Put 1 hole stopper in jug and connect jar of water to jug with rubber hose (this is an air cock to keep oxygen out of jug which would kill the aerobic bacteria.
5. Leave the mixture until it finishes bubbling. (2-3 days)
6. Pour off liquid and distill
7. If liquid will burn it is at least 100 proof

VII ENERACTIVITIES:

EXPLORATION STUDIES IN
VOCATIONAL EDUCATION

Passive Construction Design

Objective: To make the students aware of the construction designs which would use the concepts of thermodinamics to effect energy conservation.

Materials: chalk board, overhead or some method for demonstration drawing. Examples and issustrations.

Procedure: This subunit on passive construction design can be included as part of an existing unit on house planning. The enclosed outline and illustrations are provided as guidelines.

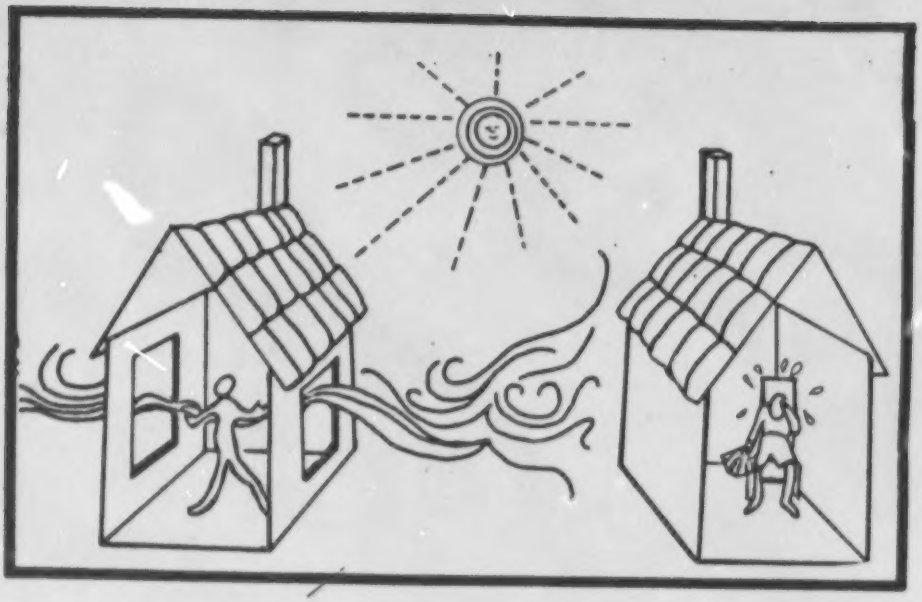
I. Concepts of thermodynamics
- A. Heat rises, cool decends
- B. Moving air feels cooler than still air
- C. The more direct the sunlight the hotter it is
- D. Dry air feels cooler than humid air

II. Design
- A. Orientation on a north/south axis
- B. Overhangs, soffits and porches
- C. Roof design
- D. Colors for shingles and outside walls
- E. Solar heating
  1. House
  2. Water
- F. High efficiency appliances
  1. Heat pumps
  2. Refrigerator
  3. Hot water heaters
- G. Sky lights

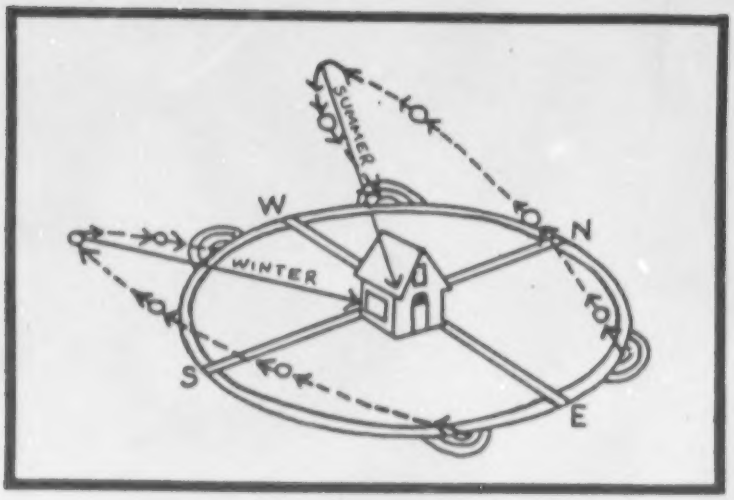
III. Ventilation
- A. Soffit
- B. Attic vents
  1. turbine
  2. Fan vents on thermostats
  3. Gable end vents
  4. Peak vents
- C. Air circulation (paddle fans)

IV. Insulation
- A. Roof
- B. Attic floor
- C. Gable ends
- D. Outside walls
- E. Inside walls
- F. Floors
- G. A/C and heating ducks
- H. Plumbing
- I. Windows

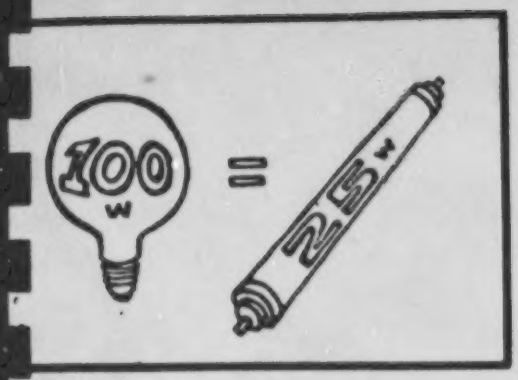
V. Landscaping
- A. Trees
- B. Shrubs



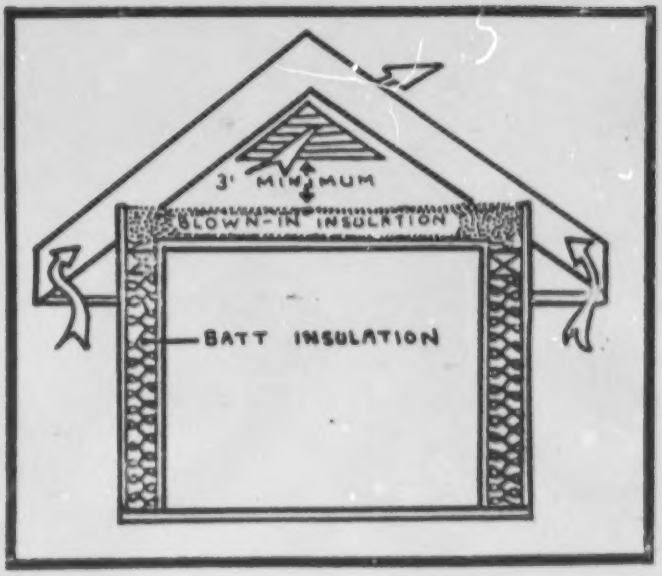
The Climatic Effects of Wind and Sun.



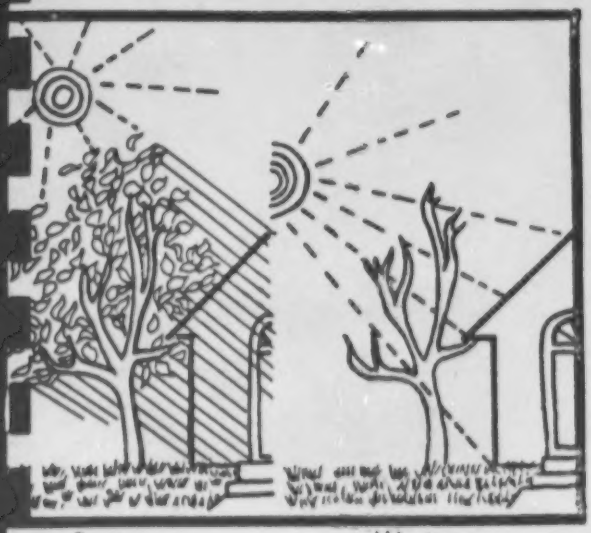
Sun Angles for Winter and Summer.



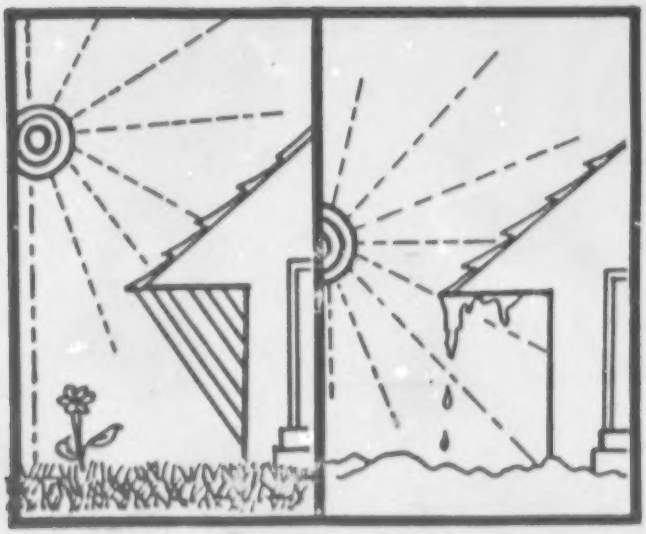
Fluorescent vs.
Incandescent Lighting.



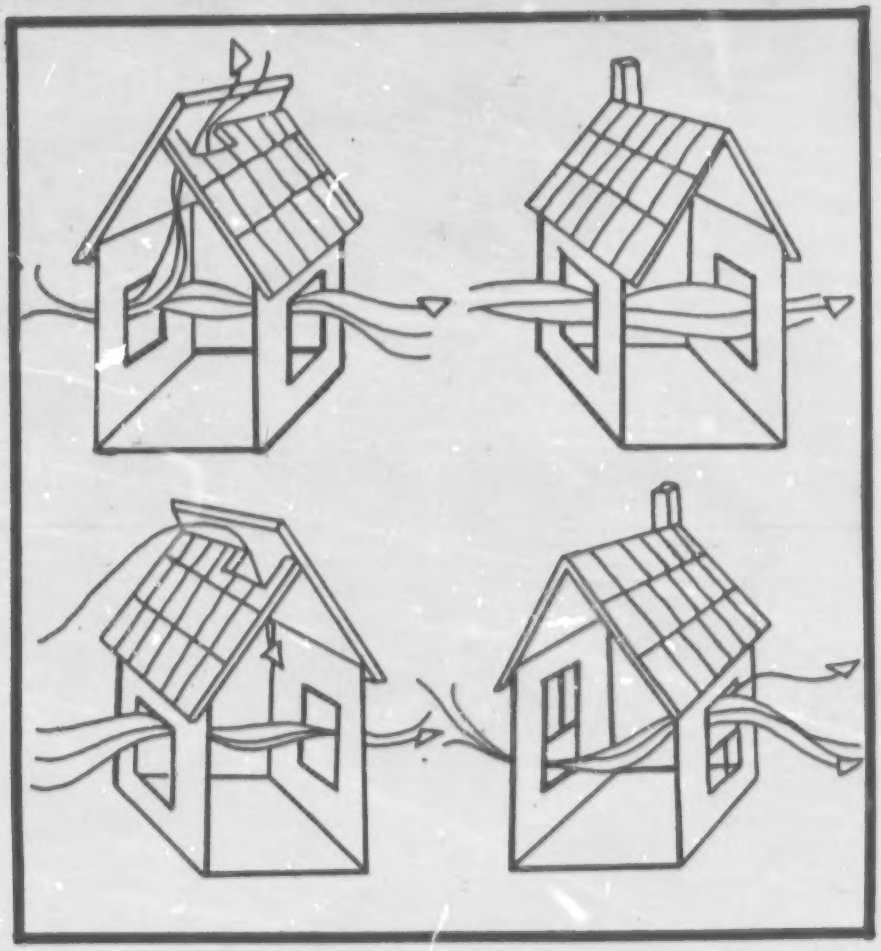
Combining Attic Ventilation with Two Types of Insulation.



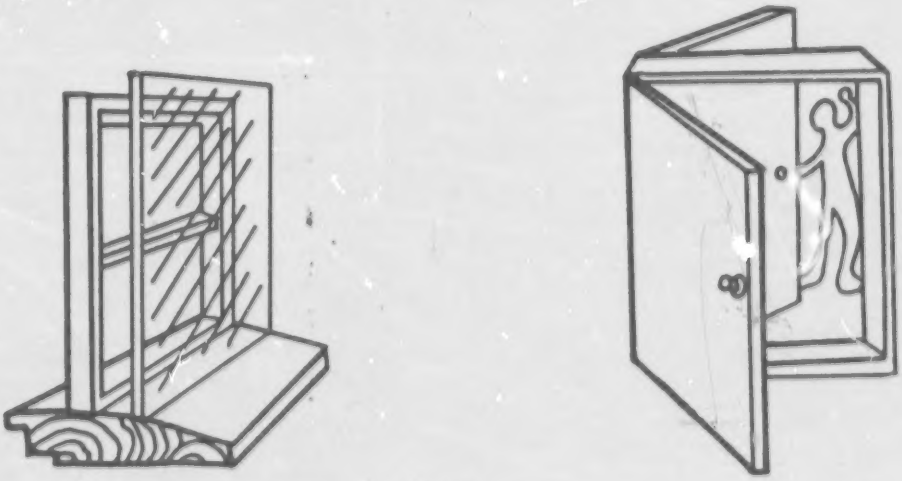
Climatic Impact of Deciduous Trees.



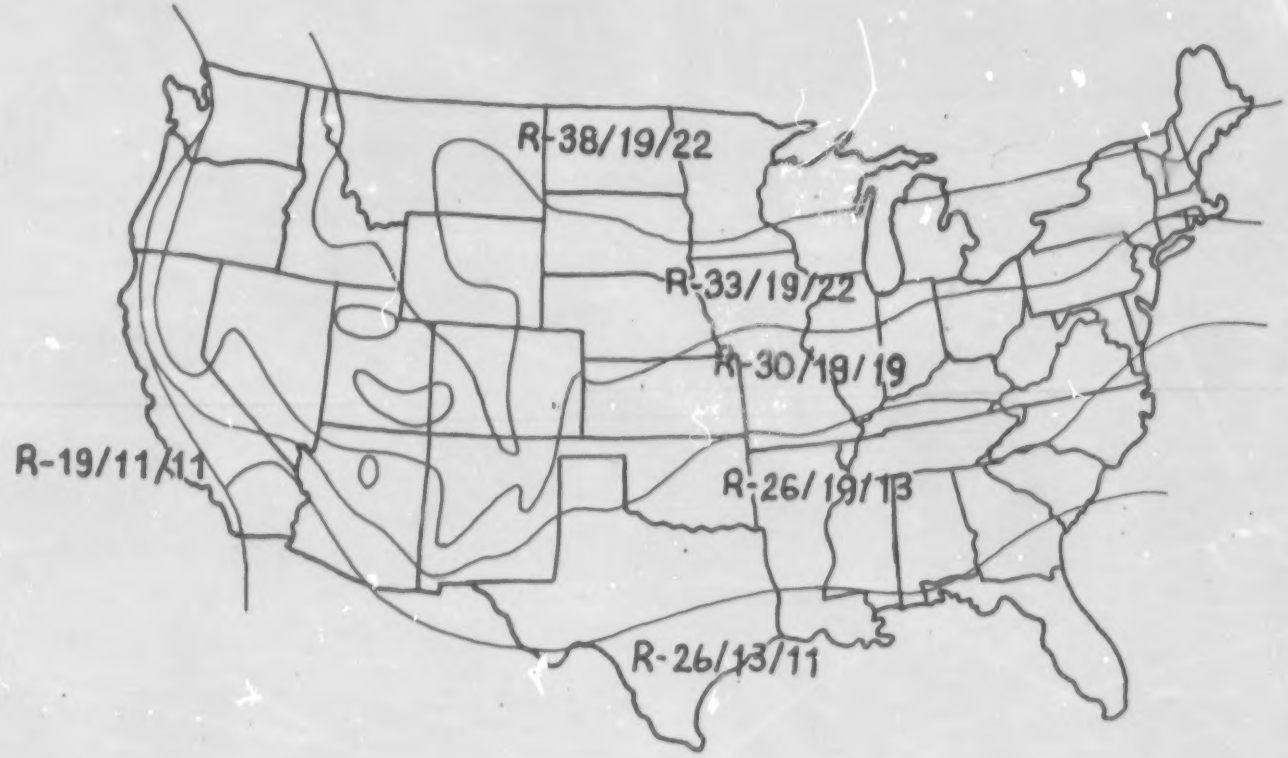
Summer and
Winter Sun.



Natural Ventilation Patterns.

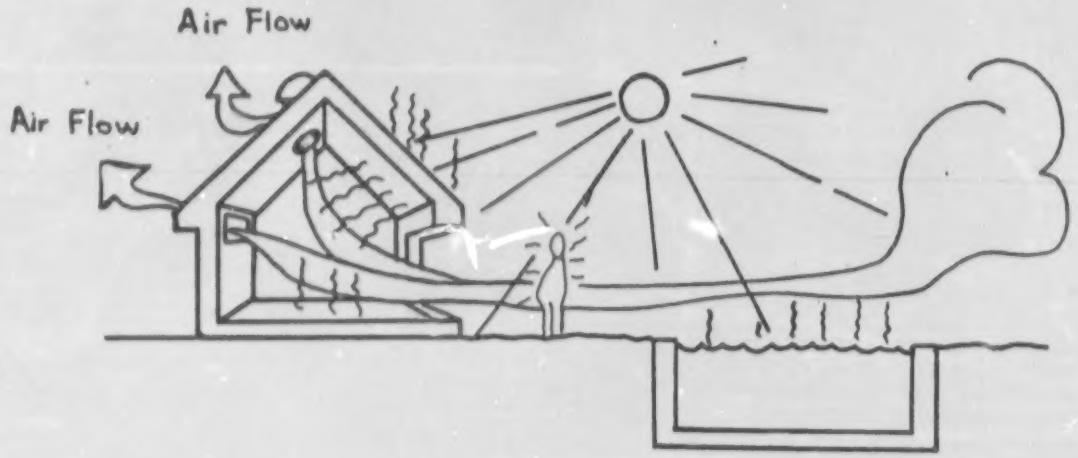


Storm Window Panel *(left)* and Storm Door *(right)*.

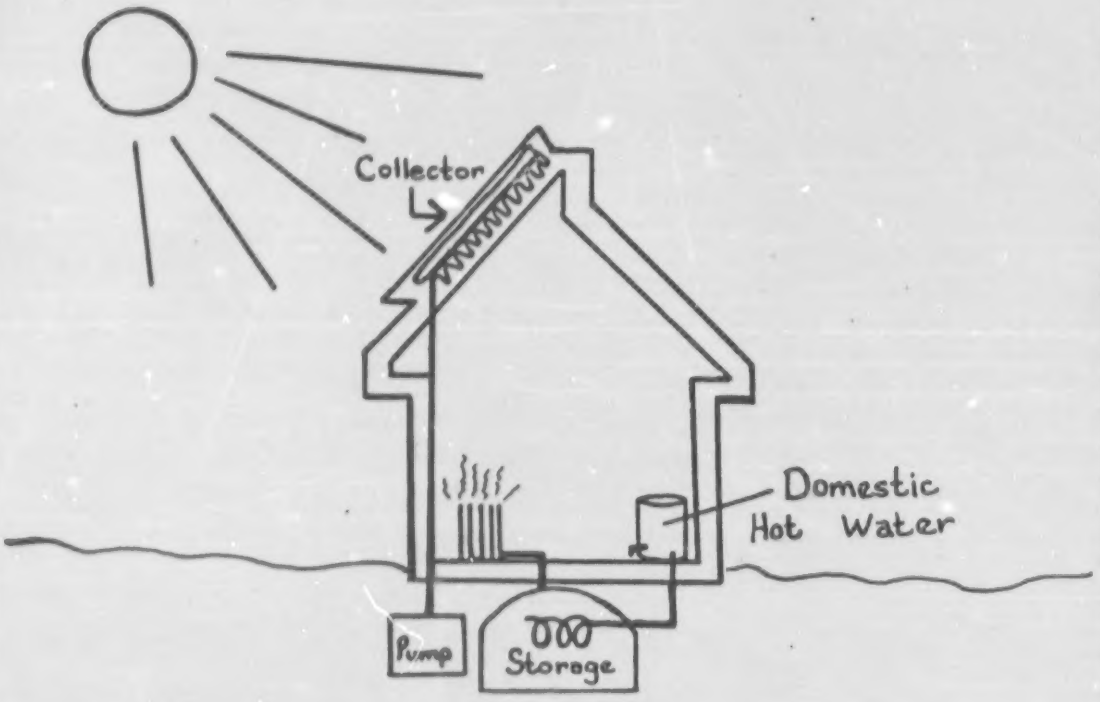


Source : Owens-Corning

New Recommended "R-Values": Ceilings/Walls/Floors
for six U.S. climatic zones.

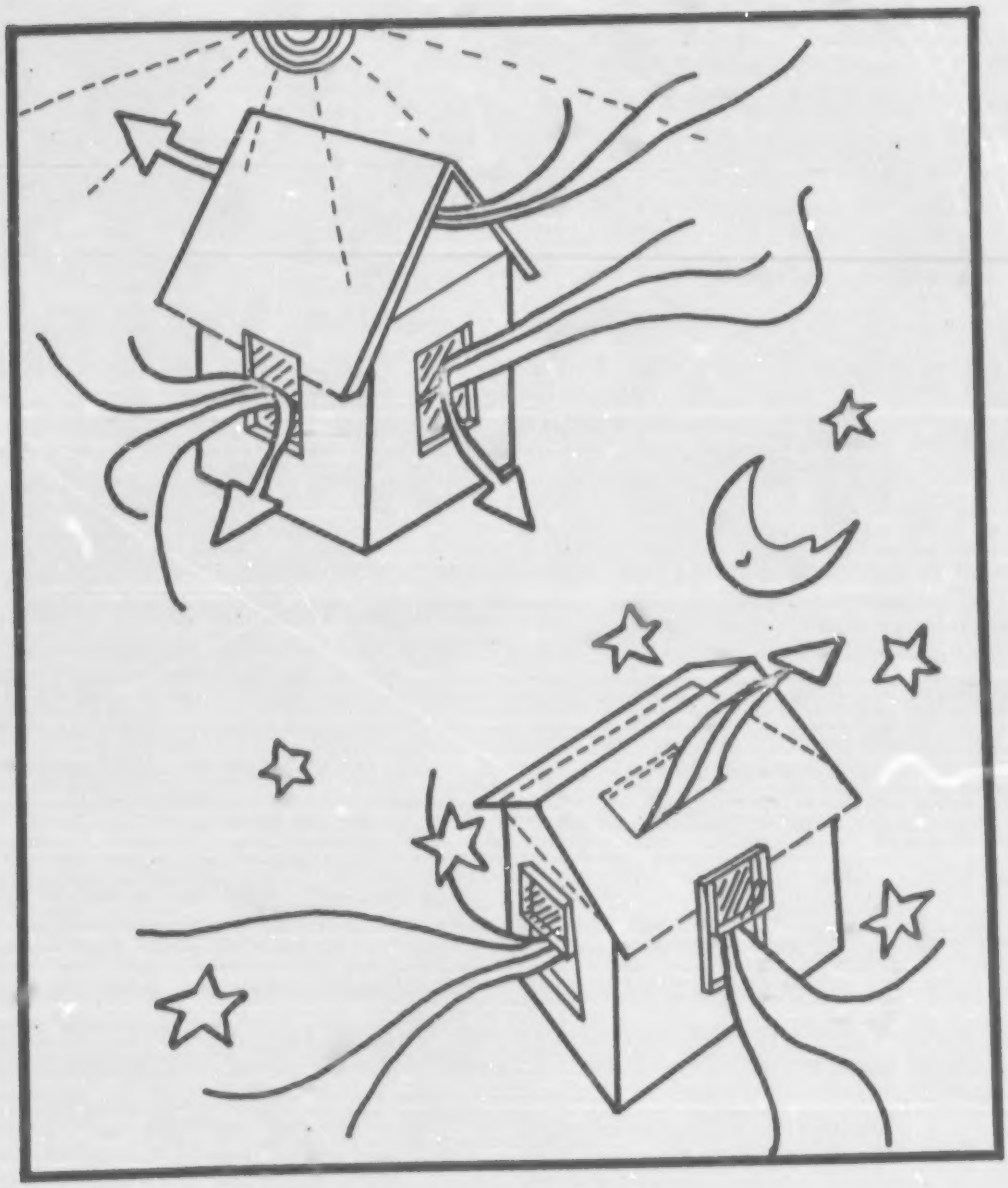


PASSIVE



ACTIVE

Passive and Active Solar Systems.



During Warmer Seasons
Natural Venilation Cycle

ACTIVITY 4

Working with EnergyGuide Labels

The EnergyGuide Label is a new approach to conserving energy. To become aware of the EnergyGuide and to have extra material on it, current resources are important. Below is a list of suggested activities.

1. Cut out appropriate labels for the appliances in your classroom and attach them to the appliances. Make sure you have checked the correct capacity size and appliance type. Sample labels are attached.

2. Go to retail stores (or use the home economics laboratory) that sell appliances and imagine that you are going to buy a specific appliance—one that has an EnergyGuide Label. Ask the salesperson to explain the label to you. Did you consider?. . .

a. When making a comparison between the different brands and models of a particular appliance to look for price information. It may be necessary to go to more than one store to compare. Be sure that you compare models of the same type and capacity (in cubic feet, Btu's, etc.), and don't forget. . .

b. It is important when comparison shopping to look at *total* cost—both the purchase price *and* the operating cost. Remember, labels give comparative operating costs and energy efficiency ratings. For more information . . .

c. Write to the Federal Trade Commission (Division of Energy and Product Information, Federal Trade Commission, 6th & Pennsylvania Avenue, Washington, DC 20580) and the Department of Energy (Technical Information Center, U.S. Department of Energy, P.O. Box 62, Oak Ridge, TN 37830) to find out more about the appliance, and conserving energy.

SAMPLE LABELS

Clothes Washer
Capacity: Compact

(Name of Corporation)
Model(s) SL301, SL309

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97¢ per kilowatt hour and a natural gas rate of 36.7¢ per therm

Only compact size clothes washers are used in the scale

Electric Water Heater

Model with lowest energy cost $22

$58

Model with highest energy cost $87

THIS MODEL

[redacted] Estimated yearly energy cost [redacted]

Gas Water Heater

Model with lowest energy cost $20

$22

Model with highest energy cost $24

THIS MODEL

[redacted] Estimated yearly energy cost [redacted]

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

with an electric water heater

Loads of clothes per week		2	4	6	8	12
[redacted] Estimated yearly $ cost shown below [redacted]						
Cost per kilowatt hour	2¢	$7	$14	$21	$29	$42
	4¢	$14	$29	$43	$57	$85
	6¢	$21	$43	$64	$86	$129
	8¢	$29	$57	$86	$114	$172
	10¢	$36	$71	$107	$143	$214
	12¢	$43	$85	$128	$172	$256

with a gas water heater

Loads of clothes per week		2	4	6	8	12
[redacted] Estimated yearly $ cost shown below [redacted]						
Cost per therm (100 cubic feet)	10¢	$2	$4	$6	$8	$12
	20¢	$4	$8	$12	$16	$24
	30¢	$6	$11	$17	$22	$34
	40¢	$8	$15	$23	$30	$46
	50¢	$10	$19	$29	$38	$58
	60¢	$12	$22	$34	$44	$68

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour or therm) in your area, and for estimated costs if you have a propane or oil water heater.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 8399601)

Freezer
Capacity: 26 Cubic Feet

(Name of Corporation)
Model(s) SH405, SH413
Type of Defrost: Manual

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97¢ per kilowatt hour

Only models with 25.5 to 27.4 cubic feet are compared in the scale

Model with lowest energy cost $95

$120

THIS MODEL

Model with highest energy cost $140

[redacted] Estimated yearly energy cost [redacted]

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

		Yearly cost
[redacted] Estimated yearly $ cost shown below [redacted]		
Cost per kilowatt hour	2¢	$48
	4¢	$97
	6¢	$145
	8¢	$193
	10¢	$241
	12¢	$290

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 14332)

SAMPLE LABELS

(For Furnaces)

ENERGYGUIDE

You can save substantially on home heating and cooling energy costs by following the simple steps outlined below:

1. Weatherproof your house
2. Assure energy efficient heating and cooling equipment selection and installation
3. *Operate and maintain your system to conserve energy.

Help conserve energy. Compare the energy efficiency rating and cost information for this model with others. Check the figures and spend less on energy.

Your contractor has the energy facts sheets. Ask for them.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

78

91

Water Heater-Oil

(Name of Corporation)
Model(s) RP23, RP38

ENERGYGUIDE

Estimates on the scale are based on a national average oil rate of 62¢ per gallon

Only models with first hour ratings of 75 to 86 gallons are used in the scale

Model with lowest energy cost $127

$134

THIS ▼ MODEL

Model with highest energy cost $159

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests

How much will this model cost you to run yearly?

		Yearly cost
Cost per gallon	52¢	$112
	56¢	$121
	60¢	$130
	64¢	$138
	68¢	$147
	72¢	$156

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 361029)

92

SAMPLE LABELS

Room Air Conditioner
Capacity: 6,000 BTU/hr.

(Name of Corporation)
Model(s) FD 1601

ENERGYGUIDE

Models with the most efficient energy rating number use less energy and cost less to operate

Models with 5,200 to 7,699 BTU's cool about the same space

Less efficient model 5.6

9.9

Most efficient model 10.2

THIS MODEL

Energy Efficiency Rating (EER)

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly hours of use		250	750	1000	2000	3000
		Estimated yearly $ cost shown below				
Cost per kilowatt hour	2¢	$3	$8	$11	$22	$34
	4¢	$6	$17	$22	$45	$67
	6¢	$8	$25	$34	$67	$101
	8¢	$11	$34	$45	$90	$134
	10¢	$14	$42	$56	$112	$168
	12¢	$17	$50	$67	$134	$202

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 20648)

Room Air Conditioner
Capacity: 6,000 BTU/hr.

(Name of Corporation)
Model(s) SA 714, SA 718

ENERGYGUIDE

Models with the most efficient energy rating number use less energy and cost less to operate

Models with 5,200 to 7,699 BTUs cool about the same space

Less efficient model 5.6

7.3

Most efficient model 10.2

THIS MODEL

Energy Efficiency Rating (EER)

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly hours of use		250	750	1000	2000	3000
		Estimated yearly $ cost shown below				
Cost per kilowatt hour	2¢	$6	$17	$22	$44	$66
	4¢	$11	$44	$66	$88	$132
	6¢	$17	$50	$66	$132	$198
	8¢	$22	$66	$88	$176	$264
	10¢	$28	$83	$110	$220	$330
	12¢	$33	$99	$132	$264	$396

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 20648)

SAMPLE LABELS

Dishwasher
Capacity: Standard

(Name of Corporation)
Model(s) MR328, XL12, NA83

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97 ¢ per kilowatt hour and a natural gas rate of 36.7 ¢ per therm

Only standard size dishwashers are used in the scale

Electric Water Heater

Model with lowest energy cost $62

$73

Model with highest energy cost $92

THIS MODEL

[redacted] Estimated yearly energy cost

Gas Water Heater

Model with lowest energy cost $26

$31

Model with highest energy cost $40

THIS MODEL

[redacted] Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

with an electric heater

Loads of dishes per week		2	4	6	8	12
[redacted] Estimated yearly $ cost shown below						
Cost per kilowatt hour	2¢	$7	$15	$22	$29	$44
	4¢	$15	$29	$44	$59	$88
	6¢	$22	$44	$66	$88	$132
	8¢	$29	$59	$88	$117	$176
	10¢	$37	$73	$110	$146	$220
	12¢	$44	$88	$132	$176	$264

with a gas water heater

Loads of dishes per week		2	4	6	8	12
[redacted] Estimated yearly $ cost shown below						
Cost per therm (100 cubic feet)	10¢	$4	$8	$12	$16	$24
	20¢	$5	$11	$16	$22	$33
	30¢	$7	$14	$21	$28	$41
	40¢	$8	$17	$25	$33	$50
	50¢	$10	$19	$29	$39	$58
	60¢	$11	$22	$34	$45	$67

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour or therm) in your area, and for estimated costs if you have a propane or oil water heater.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 73908)

80

95

Dishwasher
Capacity: Standard

(Name of Corporation)
Model(s) CD1814, CL1950

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97 ¢ per kilowatt hour and a natural gas rate of 36.7 ¢ per therm

Only standard size dishwashers are used in the scale

Electric Water Heater

Model with lowest energy cost $62

$89

Model with highest energy cost $92

THIS MODEL

[redacted] Estimated yearly energy cost

Gas Water Heater

Model with lowest energy cost $26

$38

Model with highest energy cost $40

THIS MODEL

[redacted] Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

with an electric water heater

Loads of dishes per week		2	4	6	8	12
[redacted] Estimated yearly $ cost shown below						
Cost per kilowatt hour	2¢	$9	$17	$26	$35	$52
	4¢	$17	$34	$52	$69	$103
	6¢	$26	$52	$78	$104	$156
	8¢	$34	$69	$104	$138	$207
	10¢	$43	$87	$130	$173	$260
	12¢	$52	$104	$156	$208	$312

with a gas water heater

Loads of dishes per week		2	4	6	8	12
[redacted] Estimated yearly $ cost shown below						
Cost per therm (100 cubic feet)	10¢	$5	$10	$15	$19	$29
	20¢	$7	$13	$20	$26	$39
	30¢	$8	$17	$25	$33	$50
	40¢	$10	$20	$30	$40	$60
	50¢	$12	$24	$35	$47	$71
	60¢	$13	$27	$41	$54	$81

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour or therm) in your area, and for estimated costs if you have a propane or oil water heater.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 73908)

96

SAMPLE LABELS

Dishwasher
Capacity: Standard

(Name of Corporation)
Model(s) MR328, XL12, NA83

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97 ¢ per kilowatt hour and a natural gas rate of 36.7 ¢ per therm

Only standard size dishwashers are used in the scale

Electric Water Heater

Model with lowest energy cost $50 — **$60** — Model with highest energy cost $84

▼ THIS MODEL

[illegible] Estimated yearly energy cost [illegible]

Gas Water Heater

Model with lowest energy cost $19 — **$27** — Model with highest energy cost $42

▼ THIS MODEL

[illegible] Estimated yearly energy cost [illegible]

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

with an electric water heater

Loads of dishes per week		2	4	6	8	12
[illegible] Estimated yearly $ cost shown below is						
Cost per kilowatt hour	2¢	$6	$12	$18	$24	$36
	4¢	$12	$24	$36	$48	$72
	6¢	$18	$36	$54	$72	$108
	8¢	$24	$48	$72	$96	$144
	10¢	$30	$60	$90	$120	$180
	12¢	$36	$72	$108	$144	$216

with a gas water heater

Loads of dishes per week		2	4	6	8	12
[illegible] Estimated yearly $ cost shown below is						
Cost per therm (100 cubic feet)	10¢	$2	$4	$5	$7	$11
	20¢	$4	$8	$11	$15	$23
	30¢	$6	$11	$17	$22	$33
	40¢	$7	$15	$22	$29	$44
	50¢	$9	$19	$28	$37	$56
	60¢	$11	$22	$33	$44	$66

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour or therm) in your area, and for estimated costs if you have a propane or oil water heater.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 73906)

Refrigerator-Freezer
Capacity: 17 Cubic Feet

(Name of Corporation)
Model(s) KR661-H
Type of Defrost: Full Automatic

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97¢ per kilowatt hour

Only models with 16.5 to 18.4 cubic feet are compared in the scale

Model with lowest energy cost $50 — **$82** — Model with highest energy cost $88

THIS ▼ MODEL

[illegible] Estimated yearly energy cost [illegible]

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

		Yearly cost
[illegible] Estimated yearly $ cost shown below [illegible]		
Cost per kilowatt hour	2¢	$33
	4¢	$66
	6¢	$99
	8¢	$132
	10¢	$165
	12¢	$198

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 371026)

$350

Room Air Conditioner
Capacity: 6,000 BTU/hr.

(Name of Corporation)
Model(s) SA 714, SA 718

ENERGYGUIDE

Models with the most efficient energy rating number use less energy and and cost less to operate

Models with 5,200 to 7,699 BTUs cool about the same space

Less efficient model 5.6

7.3

Most efficient model 10.2

▼ THIS MODEL ▼

Energy Efficiency Rating (EER)

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly hours of use		250	750	1000	2000	3000
		Estimated yearly $ cost shown below				
Cost per kilowatt hour	2¢	$6	$17	$22	$44	$66
	4¢	$11	$44	$66	$88	$132
	6¢	$17	$50	$66	$132	$198
	8¢	$22	$66	$88	$176	$264
	10¢	$28	$83	$110	$220	$330
	12¢	$33	$99	$132	$264	$396

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 20648)

82

93

$300

Room Air Conditioner
Capacity: 6,000 BTU/hr.

(Name of Corporation)
Model(s) AR6000

ENERGYGUIDE

Models with the most efficient energy rating number use less energy and and cost less to operate

Models with 5,200 to 7,699 BTU's cool about the same space

Less efficient model 5.6

5.7

Most efficient model 10.2

▼▼ THIS MODEL MODEL ▼

Energy Efficiency Rating (EER)

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly hours of use		250	750	1000	2000	3000
		Estimated yearly $ cost shown below				
Cost per kilowatt hour	2¢	$5	$16	$21	$42	$63
	4¢	$11	$32	$42	$84	$126
	6¢	$16	$47	$63	$126	$189
	8¢	$21	$63	$84	$168	$252
	10¢	$26	$79	$105	$210	$315
	12¢	$32	$95	$126	$252	$378

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 20648)

100

$250

Dishwasher
Capacity: Standard

(Name of Corporation)
Model(s) MR328, XL12, NA83

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97 ¢ per kilowatt hour and a natural gas rate of 36.7 ¢ per therm

Only standard size dishwashers are used in the scale

Electric Water Heater

Model with lowest energy cost $62

$73

Model with highest energy cost $92

THIS MODEL

Estimated yearly energy cost

Gas Water Heater

Model with lowest energy cost $26

$31

Model with highest energy cost $40

THIS MODEL

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

with an electric water heater

Loads of dishes per week		2	4	6	8	12
Estimated yearly $ cost shown below:						
Cost per kilowatt hour	2¢	$7	$15	$22	$29	$44
	4¢	$15	$29	$44	$59	$88
	6¢	$22	$44	$66	$88	$132
	8¢	$29	$59	$88	$117	$176
	10¢	$37	$73	$110	$146	$220
	12¢	$44	$88	$132	$176	$264

with a gas water heater

Loads of dishes per week		2	4	6	8	12
Estimated yearly $ cost shown below:						
Cost per therm (100 cubic feet)	10¢	$4	$8	$12	$16	$24
	20¢	$5	$11	$16	$22	$33
	30¢	$7	$14	$21	$28	$41
	40¢	$8	$17	$25	$33	$50
	50¢	$10	$19	$29	$39	$58
	60¢	$11	$22	$34	$45	$67

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour or therm) in your area, and for estimated costs if you have a propane or oil water heater.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

Part No. (73909)

101

$230

Dishwasher
Capacity: Standard

(Name of Corporation)
Model(s) CD1814, CL1930

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97 ¢ per kilowatt hour and a natural gas rate of 36.7 ¢ per therm

Only standard size dishwashers are used in the scale

Electric Water Heater

Model with lowest energy cost $62

$89

Model with highest energy cost $92

THIS MODEL

Estimated yearly energy cost

Gas Water Heater

Model with lowest energy cost $26

$38

Model with highest energy cost $40

THIS MODEL

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

with an electric water heater

Loads of dishes per week		2	4	6	8	12
Estimated yearly $ cost shown below:						
Cost per kilowatt hour	2¢	$9	$17	$26	$35	$52
	4¢	$17	$34	$52	$69	$103
	6¢	$26	$52	$78	$104	$156
	8¢	$34	$69	$104	$138	$207
	10¢	$43	$87	$130	$173	$260
	12¢	$52	$104	$156	$208	$312

with a gas water heater

Loads of dishes per week		2	4	6	8	12
Estimated yearly $ cost shown below:						
Cost per therm (100 cubic feet)	10¢	$5	$10	$15	$19	$29
	20¢	$7	$13	$20	$26	$39
	30¢	$8	$17	$25	$33	$50
	40¢	$10	$20	$30	$40	$60
	50¢	$12	$24	$35	$47	$71
	60¢	$13	$27	$41	$54	$81

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour or therm) in your area, and for estimated costs if you have a propane or oil water heater.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

Part No. (739[illegible])

102

83

ADDITIONAL REFERENCES

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State Solar Legislation. Rockville, Maryland: National Solar Heating and Cooling Information Center, 1977.

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